The New Zealand

Journal of Agriculture.

VOL. 49. WELLINGTON, 20TH DECEMBER, 1934. No. 6.

THE CONTROL OF THE GRASS-GRUB *(ODONTRIA ZEALANDICA)* IN SMALL AREAS.

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THE following account has been prepared for those who are troubled with the grass-grub in relatively small areas, such as lawns, playing-areas, nurseries, gardens, &c.

Treatments that can be adopted for each are given under appropriate headings below.

DESCRIPTION OF THE STAGES OF THE GRASS-GRUB.

The adult ("A" Fig. 1) is commonly called the brown beetle on account of its colour. It is a typical beetle with two hard wing cases on the back, the whole insect being approximately $\frac{2}{3}$ in. long.

The spherical egg is minute and white, and is approximately the size of a pin-head.

The larva or "grub" ("B" Fig. 1) is white and when found is usually curled up in a semicircle. The head is brown and the hind part of the abdomen is usually dark in colour and somewhat swollen in appearance. When fully grown the grub is approximately 1 in. long. The pupa, when first formed, is white, but soon deepens to brown, and is approximately $\frac{1}{2}$ in. long.

LIFE-HISTORY AND HABITS.

The adult beetle is on the wing during the latter part of October and during November, December, and sometimes into early January. It is most abundant during late November and early December. During the day the beetles hide beneath vegetation on the ground or burrow a short way into the soil and take to the wing just at dusk, making a conspicuous droning noise that is quite characteristic. These flights take place close to the ground and occur most commonly on warm "muggy" evenings, cold and wet conditions exercising an inhibitory influence. Feeding is carried out at night, favoured hosts being the stone fruits such as peaches and nectarines which are frequently entirely stripped of their leaves, while whole fields of cruciferous crops in the seedling stage are frequently destroyed. The foliage of willow trees is another favoured host.

When the adult female enters the ground it does so not only for refuge, but also to lay its eggs about ½ in. to 1 in. below the surface, among the roots of suitable vegetation. In about ten days these eggs hatch and produce the characteristic white grubs which, of course, are at first very small. Feeding and growth rapidly

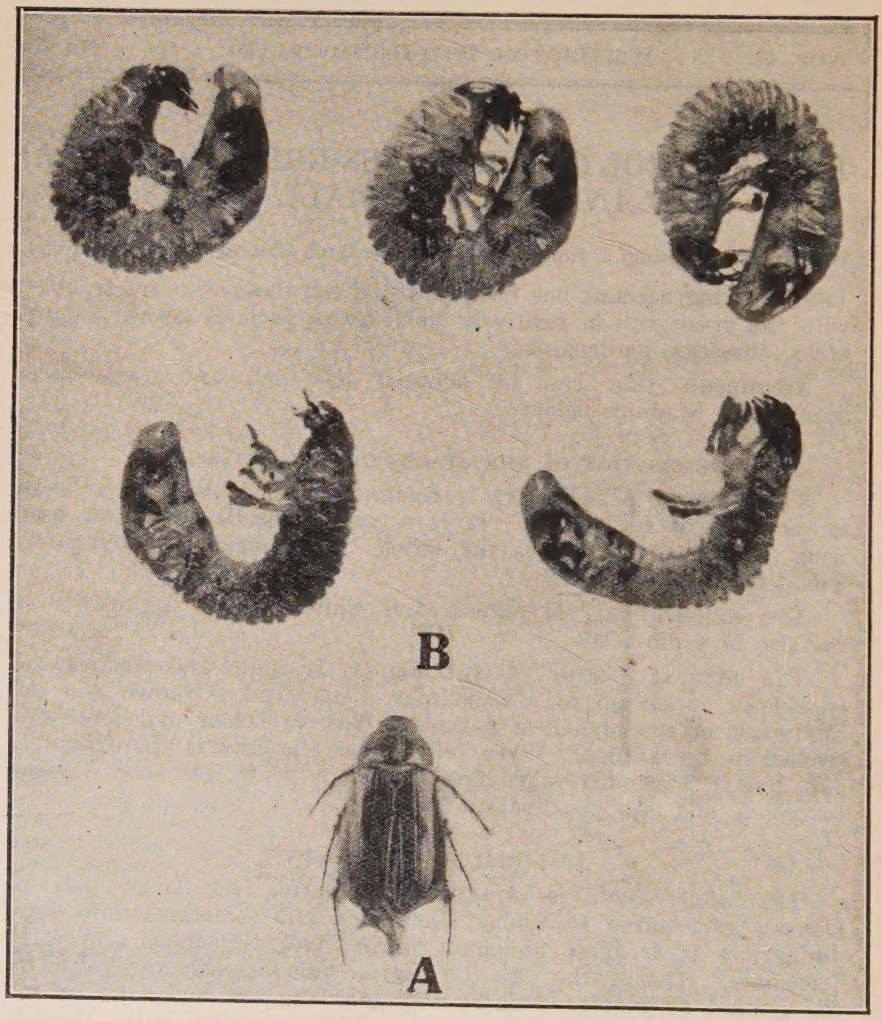

FIG. 1. A, GRASS-GRUB BEETLE. B, GRASS-GRUBS.
(Both much enlarged.)
[*Photo. by H. Drake.*

take place, and by February the presence of the grass-grub is usually only too plain. It is characteristic of this pest that it causes damage to vegetation in patches, such patches probably being selected for egg-laying because they are softer and easier for the beetle to burrow into than are the harder and stiffer

surrounding areas, or else the patches occur where the swarms of beetles settle and lay their eggs. By April or May the damage has reached its maximum, and especially in the dry season great havoc may be wrought. When winter comes on, the grubs burrow down into the ground to a deeper level to escape the cold as much as possible, although in the warmer climates great numbers can usually be found still feeding at the surface all through the winter. While sheltering from the cold the grubs construct smooth walled, more or less round, earthen cells in which they lie in a curled up position. They remain here in a three-quarters grown state until the warmer weather of August causes them to resume their activities. Grub damage at this time, however, is almost negligible compared with that which is caused in the autumn, the grubs diminishing greatly in concentration during the winter. By September and October the grubs are full-grown and descend again to transform to the pupæ which are contained in smooth walled earthen cells. During the latter part of October and during November and even December the adult beetles make their way out of the ground to commence the cycle again.

Grub-control in Lawns and Playing-areas.

The available methods of control can be conveniently divided up into two classes :—

(1) "Temporary" by which control of the grub is secured for one season only.

(2) "Permanent" by which control is secured for several seasons.

(1) Temporary Measures.

*(a) Carbon Disulphide Injection Method.**

Measured quantities of carbon disulphide are applied to the area of infestation by means of holes 3 in. to 4 in. deep. The holes should be spaced at intervals of 1 ft. The quantity of carbon disulphide to be applied varies with the nature of the soil. If it is of a sandy nature $\frac{1}{8}$ to $\frac{1}{4}$ fluid ounce per hole is sufficient, but where the texture is heavier $\frac{1}{3}$ fluid ounce is necessary. It is advisable to avoid contact of the liquid with the grass, and plug each hole immediately following application.

Application is simplified by the use of an injecting-machine (Fig. 2). The apparatus consists of a zinc or copper cylindrical container attached to a long hollow cast-iron spike with a conical extremity. Two handles are provided for holding the apparatus in position and with the aid of an attached pedal the hollow spike is driven to the required depth in the soil. Inside the instrument is a pump fitted with a piston. On depressing the rod of the piston, which projects above the handles, a valve opens and a measured dose of carbon disulphide is projected into the soil through an aperture at the end of the hollow tube. The hole made in the turf must be blocked up immediately to prevent evaporation of the chemical into the air. With this instrument 6 c.c. (approximately $\frac{1}{8}$ to $\frac{1}{4}$ fluid ounce) per hole in light sandy soil and 10 c.c.

* Carbon disulphide should be handled with care, as it is inflammable, poisonous, and explosive.

(approximately $\frac{1}{3}$ fluid ounce) per hole in stiffer soil will be required for each injection. In "grubby" areas, the possession of one of these instruments will prove to be a real asset.

(b) Carbon Disulphide Emulsion Method.

Where the carbon disulphide has to be injected other than by machine it will usually be found that there are small browned areas of grass surrounding the lip of each hole, caused through the spilling of the chemical. This may appear undesirable in the eyes of some. To overcome this and to avoid making holes in, for example, a golf-green, an emulsion of carbon disulphide may be used. Such an emulsion that has been found to be very satisfactory is one where a well emulsified coal oil has been used—viz., "Restar." The formula, expressed in parts by volume, of the stock solution is as follows: Carbon disulphide, 7; water, 7; "Restar," 1.

The primary emulsion is made by shaking together vigorously the carbon disulphide and "Restar" until a thick cream is formed. Finally, the water is added. A good test for a satisfactory emulsion is to see that the carbon disulphide does not separate out on dilution. For use, 1 part by volume of this stock emulsion must be diluted with 135 parts of water, and by means of a watering-can this must be applied to infested turf at the rate of $3\frac{1}{2}$ gallons per square yard of surface.

It is most important to see that the material does not lie on the surface of the ground, for if even the slightest puddle is allowed to form, damage will result. For this reason application must be made very slowly, only such a quantity of emulsion being applied at a time as will soak in immediately. Where the liquid does not soak in readily, the turf may be lifted and loosened with a fork.

(c) The Coal-tar Distillate Method.

The coal-tar distillate used (*e.g.*, "Restar") must be thoroughly emulsified to form a white emulsion with water. The material is used at the rate of 1 part of coal-tar distillate to 150 parts of water by volume. Application is made by means of a watering-can at the rate of 3 gallons per square yard of infested turf. It is very important that this mixture be applied slowly so that no puddling takes place, and for this reason the operator will most likely find it convenient to use the fork to loosen up the turf. After the material has soaked in, 3 gallons of clean water per square yard must be applied *immediately*. This is necessary to wash the emulsion off the grass, otherwise severe burning will occur. It will be found convenient to treat about 2 square yards at a time, and while the 3 gallons per square yard of clean water are soaking in on this plot which has already had the distillate applied to it, another 2 square yards can be treated with the emulsion, and so on.

(d) The Naphthalene Method.

This method is applicable only to fallow ground because the material is a solid which must be worked into the soil. Therefore it is useful only in cases where soil is being prepared for sowing down to turf, &c. Naphthalene (free from tar) is the best material to use, and should be applied by digging the material about 3 in. into the loose

fallow soil at the rate of 3 oz. per square yard. The area should not be sown until at least a month after the application of the insecticide.

This material and its related proprietary mixtures are of no use on formed turf.

(2) PERMANENT MEASURES.

These involve the use of arsenate of lead powder as used for spraying fruit-trees. Our experiments have shown that this method will keep turf free from grub for several seasons. It differs from the methods described above in that it acts more slowly for immediate control, but once it is in the ground it acts as a preventive against subsequent infestations.

For areas such as lawns ¾ oz. of arsenate of lead powder per square yard of surface should be used. The required quantity should be thoroughly mixed with about twice its volume of slightly moist (not wet) fine soil or sand and broadcast evenly. It is a good idea to rub the material well in with the back of a rake. For large areas such as fairways the arsenate may be reduced to a minimum of ⅜ oz. to ½ oz. per square yard.

After the arsenate has been laid down for at least a month it is a very good plan to give the treated area a thorough dressing with a good manure mixture (see below). Application should not be made while the grass is wet as under these conditions a quantity of arsenate will stick to the leaves and may not subsequently enter the soil.

In the case of a lawn that has just been seeded down, grub-proofing may be carried out as follows: Apply the arsenate (¾ oz. per square yard) and soil or sand mixture broadcast, but only when the grass is strong and the turf fairly firm, otherwise, in loose soil, the powder will easily be washed down and distributed over such a wide area that the concentration of the poison in the top layer is insufficient to kill grubs that might enter subsequently.

Another method of grub-proofing in such a case is to work thoroughly into the prepared ground before seeding, 1½ oz. of arsenate per square yard so that when the turf is finally formed the poison will extend through the top inch.

To grub-proof pieces of turf used to replace damaged ones, such turfs should be thoroughly soaked in a suspension made by mixing arsenate of lead with water at the rate of 3 lb. to 12 gallons.

RECOMMENDATIONS.

The quickest method of eradicating the grass-grub for one season is by the use of carbon disulphide, either using the injection method or the emulsion. When it is desired to destroy the grub where it is infesting only small patches in an area of lawn or other turf, this method is the most suitable. For this reason carbon disulphide always should be kept on hand where the turf is in a region that is subject to damage by the pest.

Where it is impossible to secure carbon disulphide, then the coal-tar distillate method may be used. It must be understood that this latter method at best is only a substitute for the former, and that it requires very careful handling to get satisfactory results. It should never be used on turf that will not allow the liquid to soak in

quickly without leaving puddles, as the grass is liable to be browned off temporarily. When it is used on suitable ground, however, and when the directions are followed to the letter, excellent results may be secured. There may be a little browning which should disappear in a month, but the grass will subsequently "come away" in excellent condition.

As stated previously, the naphthalene treatment is suitable only for fallow ground.

The arsenate of lead method is one that gives great promise, since it is easy to apply to even large areas, and when it is remembered that the poison remains efficient for several seasons, in the end it will prove to be the cheapest of all. Lawns, greens, and fairways can be protected completely and good playing-areas will be assured.

MANAGEMENT AS AN AID IN PREVENTING GRUB DAMAGE IN TURF.

There are several points that should be kept in mind concerning grub attack. One is that lack of moisture will aggravate the trouble, in that damaged plants are unable to draw moisture from below, because the grub has eaten through the roots and produced a layer of pulverized soil close to the surface through which capillary moisture is unable to move readily. To remedy this the roller should be used freely and on areas such as lawns and greens a reasonable supply of moisture should be maintained.

Another point is that the greatest concentrations of grubs are nearly always found in light, loose ground, because these conditions allow the female beetle to burrow in easily and lay her eggs. This points to the desirability in grass-grub areas of making prepared pieces of ground such as greens and lawns of as heavy a texture as is consistent with good condition of the turf. Another point that comes from this consideration is that, if practicable, turf should be kept as compact as possible by frequent rolling during the egg-laying period of the beetle in November and December.

The final point that should be borne in mind is that grass-grub damage can at least be greatly lessened by keeping the turf so strong, that, although grubs are present, damage may not be apparent. In this connection the use of suitable manure mixtures is almost sufficiently obvious to require no elaboration.

As it will be of interest to many readers to know just what manure can be recommended for general use on lawns Mr. E. A. Madden of this Station has kindly supplied the following particulars. For spring and autumn use the following mixture: Superphosphate, 1 part; sulphate of ammonia, 1 part. For summer use or in dry periods use the following: Superphosphate, 1 part; nitrate of soda, 1 part. Both are for use at the rate of 1 oz. of the mixture per square yard.

When the grub has been very severe, the grass should be manured every two to three months at least. Where weeds and clover are plentiful and it is desired to eliminate these the following mixture may be used in the spring and autumn but not in the summer. Superphosphate, 1 part; sulphate of ammonia, 2 parts; sulphate of iron, 1 part. This is for use at the rate of 1 and $\frac{2}{3}$ oz. per square yard.

Grub-control in Nursery Areas and Gardens.

The methods that are at present available for the destruction of the grub in areas such as these are :—

(*a*) *Carbon Disulphide* is the most efficient material that can be used, and if injected with the apparatus shown in Fig. 2 the operation can be carried out relatively quickly. If infested plants are in rows, an injection of 6 c.c. (approximately $\frac{1}{5}$ to $\frac{1}{4}$ fluid ounce), should be made at least 3 in. deep every foot. If the soil is hard and "clayey" 10 c.c. (approximately $\frac{1}{3}$ fluid ounce) per injection will probably be required. All holes must be covered in immediately the chemical has been introduced. Care must be taken that each injection is made

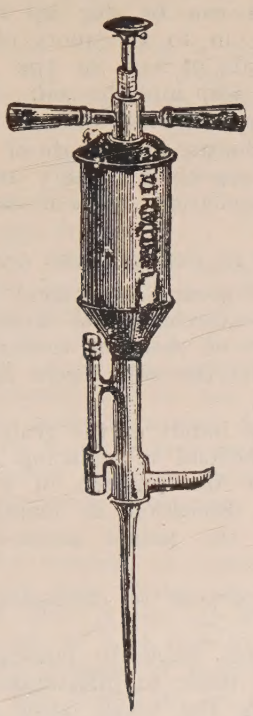

FIG. 2. CARBON DISULPHIDE INJECTION APPARATUS.
(After Wardle and Buckle.)

2 in. to 3 in. away from any plant, as the raw material in direct contact with any vegetation will injure it. If an injector is not available, then the holes can be made with a stick or some other suitable instrument and the required quantity of carbon disulphide poured into each hole, after which operation the hole is immediately closed. This operation is tedious and somewhat difficult and quicker progress can be made with the carbon disulphide "Restar" emulsion described above. If the plants are in rows this emulsion should be applied with a watering-can at the rate of $3\frac{1}{2}$ gallons every 6 yards, making the treated strips 6 in. wide. If the plants are in beds, apply

the material at the rate of 3½ gallons per square yard. Application in all cases should be made slowly so that the liquid soaks into the ground as soon as it is put on—if any puddling is allowed damage is liable to result. After the emulsion has been applied it is a good plan to give the plants a thorough sprinkling with clean water, although we have found that with this last operation omitted no injury usually results to plants hardy enough to grow during the winter. Care must be taken to emulsify the carbon disulphide properly or damage will most probably result.

(*b*) *Naphthalene and Related Preparations.*—Most solid soil-fumigants derived from the distillation of coal depend on this constituent for their efficiency. Naphthalene is useful really only in infested ground that can be dug up for treatment or where it can be worked close in to the roots of infested plants. For such areas use at the rate of 2 oz. to 3 oz. per square yard worked thoroughly 3 in. to 4 in. deep into the soil. Preparatory to planting, treated ground should be left three to four weeks.

Our experiments on the use of arsenate of lead as a "permanent" measure against the grass-grub in nursery areas are not yet definite enough to allow recommendations to be made.

MANAGEMENT IN NURSERY AND GARDEN AREAS.

Fallowing of infested ground or ground likely to be infested is a valuable method of overcoming or avoiding grass-grub attack. In large areas the cost of chemical treatment is often too great for the average man, and the only means left to him lie in proper management of his land.

Our knowledge of the habits of the grub allow us to recommend certain practices as beneficial in reducing injury. An outline of correct management for the purpose of avoiding grub injury is given below and the discussion is mainly grouped under two headings according to the plants infested, whether annuals or perennials.

Annuals: For the purpose of discussion these can be formed into three groups.

(1) Spring-sown plants liable to infestation from the previous season's grubs and also liable to infestation by grubs which hatch from eggs deposited by the beetle after the plants are in the ground.

(2) Plants sown between spring and autumn and liable to infestation by grubs hatching from eggs deposited by the beetles in November and December.

(3) Autumn-sown plants liable to infestation from grubs which have been feeding on plants that occupied the ground during the summer.

Ground that is to be used for plants of group (1) should be ploughed or dug several months before it will be required for planting and in the interval should be cultivated thoroughly, if possible, once every ten days. This operation will kill many grubs by mechanical action and a large number will be exposed to birds. If the ground has been broken out of grass it should be left fallow

until October for as long as possible and great care must be taken to cultivate it thoroughly at frequent intervals. Naturally, it is important to keep fallowed ground as free as possible from all vegetation. In grass-grub country the setting-out of susceptible plants in the spring in land that has been broken from grass immediately prior to planting is simply asking for trouble. Unless the fallowing above described can be carried out, it is far better to plant such areas in the spring to some "cleaning" crop such as potatoes or some other root crop or a non-susceptible crop such as cabbage or cauliflower. Thus a season of clean ground carrying a non-susceptible crop will pass before the susceptible plants are put out the next spring. Of course, the ground carrying the "cleaning" crop must be kept free from weeds.

For plants of group (2) fallowing is also of great importance and should be carried out for as long as possible before the planting, frequent thorough cultivation being made at weekly or ten day periods. The reason for such fallowing is to prevent the beetle from laying its eggs, the bulk of these being laid in November and December. The reason for the cultivation is to help to keep down weeds and to destroy grubs that may possibly have hatched from any eggs deposited.

For plants of group (3) fallowing is again important, and should be carried out over the egg-laying period of the beetle. The ground during this period should be kept absolutely free from all vegetation or else it can be sown to a good "cleaning" crop such as potatoes, &c., or some other non-susceptible crop so that when the autumn comes the ground will be free from grub. In grass-grub country it is much more important for autumn-sown plants than for spring-sown plants that the area used should not be broken from grass immediately before planting. Such ground should really be broken before the preceding November and put down to a non-susceptible crop.

Perennials: The above remarks on annuals are also applicable to perennials in their first year. Later on, however, not a great deal can be done if the area is too big for chemical treatment. However, the ground should be kept free from weeds at all times. The application of a light dressing of naphthalene, say 2 cwt. per acre, worked lightly into the ground at the beginning of November and as close to the plants as possible will help to stop re-infestation. This is applicable to annuals also. Care must be taken not to dust the naphthalene on to the plants, otherwise browning is liable to occur. In the case of plants showing signs of distress from grub attack it is often possible to shift them to clean ground. Before replanting, however, as much soil as possible should be removed from the roots which should then be soaked for half an hour to an hour in arsenate of lead suspension made at the rate of 4 lb. to 5 lb. of arsenate to 100 gallons of water. This will help to guard against subsequent attack.

A fact that must be borne in mind is that where host plants are present suitable for the feeding of the adult beetle, grubs are likely to cause subsequent damage. For this reason it is unwise to have hosts such as stone-fruits and willows or early planted turnip or rape crops

adjacent to areas containing plants susceptible to the grub. If the presence of such hosts cannot be avoided and it is possible to spray them, use arsenate of lead at frequent intervals at the rate of 2 lb. to 3 lb. per 100 gallons of water. In this connection, however, it must be remembered that stone-fruits will not tolerate a dose of arsenate at a greater strength than 1 lb. per 100 gallons applied at comparatively long intervals. For such susceptible trees it is best to use a spray consisting of 1 lb. arsenate of lead + 3 lb. hydrated lime per 100 gallons of water.

It is to be remembered, too, that the more vigorous a plant is the greater will be its ability to withstand grass-grub attack. In this connection the use of suitable manures is obviously desirable and often the ready application of a quick-acting manure in the presence of plenty of moisture will work wonders in lessening the effects of grub attack.

Further, a plentiful supply of water and the conservation of the moisture in the top layers of the soil greatly assist a plant to withstand grub attack. The greatest damage is usually caused by the pest when it is feeding vigorously and there is a scarcity of moisture.

Finally, the grass-grub shows a decided preference for light soils and the growing of susceptible plants on heavier land, if possible, will tend to reduce injury.

When the above remarks on nursery management are read it should be borne in mind that such remarks describe what is considered to be more or less ideal management as far as the prevention of grub damage is concerned. Many might find it impossible, for instance, to leave valuable ground fallow for a comparatively long period and of course their programmes will be determined accordingly. Nevertheless, the nearer that management follows along the ideal lines described above so much less will be the likelihood of injury caused by the pest.

GRADING OF MILK.

The grading of milk with differential payments according to grade, which was introduced during the previous season, so improved the quality of the milk-supply to cheese-factories that it was deemed advisable to frame regulations making compulsory payments for two grades, first and second, giving companies the option of making payment of a higher grade with a higher payment. It was further decided to apply the grading to milk supplied to butter-factories, that the grades be three, as in the case of cream grades—viz., finest, first, and second—and that the grading of milk for cheese-making be based on the curd test in conjunction with either the reductase test or microscopic test, and of the milk for butter-making on either one of these tests or the curd test together with the reductase or microscopic test. These regulations came into force as from the 1st August, 1933.

The curd test and reductase test are almost exclusively used, and are operated on the factory premises by the certificated milk-graders. By means of the curd test it can be demonstrated to suppliers of poorer quality milk that the quality is as indicated by the grade, and in many instances steps have been taken to effect the desired improvement.

Cheese-factory managers are unanimous that this method of grading is on sound lines, and the consensus of opinion is that the quality of the milk generally has been raised to a higher standard. This is reflected in the improved quality of the cheese output for the year.—*Report, Director, Dairy Division.*

SHEEP-DIPPING.

W. T. Collins, District Superintendent, Live-stock Division, Auckland.

Amongst the many activities associated with the management of sheep, dipping is one of the most important and yet one that does not receive the attention it should, but is often carried out in a more or less perfunctory manner. That it is important to have a flock free from external parasites cannot be gainsaid, for if sheep are infested with vermin, such as ticks and lice, they cannot be expected to thrive well and fatten or produce good wool.

Sheep suffer severely when infested with ticks or lice. These parasites attack the skin, and by their operations produce great itching, which causes the animal to gnaw itself, scratch, and rub against fences, &c. At the places where the parasites are most numerous the skin gets badly inflamed, partly due to the efforts of the animal to remove them, and partly to the attacks of the vermin themselves, with the result that the wool is pulled out, matted, or blood-stained. The severity of the itching depends on the degree of infestation. Sheep, as a rule, suffer more severely from attacks by lice than by ticks, as the lice multiply very much more quickly and are found in greater numbers. Any animal infested with ticks and lice soon loses condition and becomes weak.

In this country several external parasites attack our flocks. The ked, or, as it is more commonly called, the sheep-tick, is probably the best known. There are three species of lice: the body louse that is found in various parts of the body, but most commonly seen in the brisket and neck; the face louse, seen chiefly in the face of the sheep; and the leg louse, found chiefly in the hair of the legs below the knee and hock.

The ked or sheep-tick should not be confused with the cattle-tick found in parts of the Auckland Province. It can be distinguished by the fact that the ked, which can be described as being a wingless fly, has six legs, whereas a fully grown cattle-tick has eight legs. The life-history of the ked is also totally different from that of the cattle-tick; the former spends the whole of its life on the host, and if by any chance it falls off it will live only a few days. On the other hand, the cattle-tick drops off the host and lays its eggs in the ground, where they hatch out, and the young ticks may live for months without feeding.

The ked is probably well known to all sheep-farmers, as it is so commonly found on most flocks. A full-grown specimen is about $\frac{1}{8}$ in. in length, and, being dark in colour, is easily found in the wool. Although in some flocks the ked is found in large numbers, it is not as prolific as some species of vermin. The female brings forth only one egg or pupa at a time and only four or five in the course of a year. These eggs or pupa are small oval bodies not unlike a small apple pip and are found firmly attached to the wool. Each pupa contains an embryo ked and in about three weeks from the time they are deposited by the female, the end opens out and the young ked emerges.

Lice, which are very much smaller than ticks, are of a dull white colour. Hence it is very difficult to find them in the wool. They

are much more prolific than the ked and therefore the infestation is usually much heavier. The eggs, usually called nits, are small and pear-shaped, and have a cover or lid at one end and are found firmly attached to the wool. The young, which leave the eggs when the cover opens, are in all respects the same shape as the adults.

As neither the ked nor lice live long after leaving the host, the chief method by which clean sheep become infested is through coming in contact with already infested animals. This is more likely to take place when sheep are penned up together or in camps where they come in contact with each other. Mobs are also likely to become infested at sale-yards for, although the sheep are not actually penned up together, usually they are separated only by a few rails or a wire fence, and therefore the wool of sheep in one pen can come in actual contact with the wool of sheep in the adjoining pen and so the vermin can transfer from one mob to the other. Another method by which a flock may become infested with these parasites is the all-too-common practice of drovers leaving on the road or putting over the fence tired sheep out of the mob they are driving. These sheep are usually weak ones and liable to infestation with vermin, and they in turn infest the sheep with which they are placed. To clean a flock successfully it is essential that all sheep be properly dipped. Stragglers are sometimes left behind at mustering because they are too weak to keep up with the stronger ones, and such stragglers may be a fruitful source of infection.

To free a flock from vermin it is absolutely essential that it be properly dipped and not, as appears to be done in some cases, put through a dipping-bath simply to comply with the requirements of the Stock Act. It is a waste of money buying dip and a waste of time mustering and putting sheep through a dip unless the dipping fluid is made up just as laid down by the makers of the particular dip being used, and all details as to time of immersion, &c., are carried out to the letter. Many owners blame the dip when they fail to get results, but it can be said safely that in the great majority of cases, if not all, the fault lies with the dipper and not with the makers of the dip. The Stock Act lays it down that all longwool and crossbred sheep shall be dipped each year in the North Island between the 1st January and the 31st March, and elsewhere than in the North Island between the 1st January and the 30th April. An application for an extension of time may be granted by an Inspector of Stock, if through shortage of water or other sufficient cause it has not been possible to dip in the prescribed time.

Although the provisions of the Stock Act are complied with if the sheep are dipped once during the above period, there is no reason why they should not be put through more often. In fact, if the flock is badly infested with keds or lice it is essential that they be dipped at least twice. Poisonous dips should be used, as these are the only ones that can be relied upon to kill the vermin—especially lice. It is not difficult to kill the adult keds and lice with poisonous dips, but the eggs of the keds and the nits of the lice are much more resistant to the effect of dips, and therefore another dipping carried out about three weeks after the first one is of value for the destruction of the keds and lice hatched out subsequently to the first dipping.

One of the main reasons for failure to rid sheep of parasites by dipping is that the job is carried out with far too much hurry, and therefore the animals are not thoroughly immersed in the dip. If good results are to be obtained it is necessary for the sheep to be wet right to the skin where the parasites are found. Simply wetting the fleece is absolutely useless. When sheep are being put through a long-swim dip no trouble should be experienced in ensuring that the fleece is thoroughly saturated provided that the crutch is used and the heads plunged under once or twice to make sure the head is well wetted. It is where a short dip is used that most of the failures take place. If the fleece is to be thoroughly saturated the sheep should be in the dipping-fluid about a minute, but when a short dip is used they are often through in about a third of this time and before the fluid properly reaches the skin. Long-swim dips are the best for dipping purposes but are costly to make and fill, and for this reason are probably justified only where large flocks are being handled. Dipping can, however, be carried out just as thoroughly in a short dip provided the job is not hurried and the animals checked on their way through and given sufficient time in the fluid for the fleece to become well saturated.

Another and quite common reason for failure to get results at dipping time is that insufficient care is taken in making up the dipping fluid and the maker's instructions are not carried out properly. If good results are to be obtained it is absolutely essential that the dipping fluid be made up as laid down by the makers. Haphazard methods lead to failure to get results and disappointment to the owners of the flock.

To get results the correct amount of concentrated dip, whether powder or fluid, should be mixed with the right amount of water. To do this it is necessary to know the amount of water the dip will hold and also have the dip graduated so that water to replace that taken out by the sheep can be measured easily and accurately. When the required water has been added to the dipping-bath, the quantity of concentrate necessary can be added to bring the dipping-fluid up to the required strength.

The method often employed when measuring the capacity of the dip is to put in, say, 100 gallons of water at a time and to mark off on the side of the dip or on a rod standing upright in the dip the height to which each 100 gallons reaches. If a graduated rod is used to ascertain the quantity of fluid in a dip the rod should be shod with metal to prevent wearing away—it is necessary to use some force to make sure the rod has gone through the sediment that collects at the bottom of the dip and this tends to shorten the rod, unless properly shod.

There should be no guesswork in measuring the dipping concentrate. If a fluid concentrate is being used and a gallon is required, it should be measured carefully; likewise 2 gallons. It takes very little extra time to do this, and the results fully compensate for this little extra time and trouble. The same care when measuring is necessary if a powdered concentrate is being used. It takes a little more time and trouble to properly prepare the dipping-fluid when a powder dip is being used than it does with a fluid dip. In the first place, it is necessary to make quite sure that the powder is thoroughly broken up

and does not contain lumps, for if these are left they simply fall to the bottom of the dip and are therefore of no value in bringing the fluid up to the proper strength. The powder should be broken up as finely as possible and then mixed with sufficient water to bring it to the consistency of thick soup. This is then added to the water and the dip is thoroughly mixed, making quite sure the plunger goes right to the bottom of the dip. If the mixing has not been thoroughly carried out, there is always the possibility that the fluid at the top is over strength when first made up, with the result that the first lot of sheep put through get badly scalded and losses occur. Later on, if the fluid is left to stand and not kept mixed, the powder gradually falls to the bottom and the fluid at the top is below strength, and consequently does not destroy the parasites. From this it will be realized how very important it is to mix the dip properly in the first place and keep it mixed during dipping operations. Many appear to be of the opinion that as long as the powder has been thoroughly mixed with the water at the commencement of dipping operations, it is not necessary to use the plunger again during the day, as the very fact that the sheep are going through keeps the ingredients well mixed. Such, however, is not the case, as there is always the tendency for the powder to fall to the bottom of the dip, and to avoid this the plunger should be used not only at the commencement of dipping operations each day, but also after intervals and after every few hundred sheep have gone through. The powder is in a state of suspension rather than in solution, and the amount that will gravitate to the bottom of the dip even while the sheep are going through is surprising.

The character of the water used in making up the dipping fluid is of great importance. Hard waters do not give good results. If at all possible rain water should be used, but where sufficient is not readily at hand and spring or other hard water has to be used it should be softened by the addition of 3 lb. or 4 lb. of washing-soda, or more according to the hardness of the water, to every 100 gallons. Hard water does not "take up" the dipping concentrate well, therefore more is precipitated to the bottom and fluid at the top through which the sheep are passing is weak and unsatisfactory for killing vermin.

Sheep should be rested thoroughly immediately before being dipped. It is a mistake to dip them when overheated, as in this condition the pores of the skin are open and they are more liable to chills followed by pleurisy or pneumonia. Care should also be taken to see that the sheep are as free as possible from injuries such as dog-bites and bruising, for poisonous dips are more likely to be absorbed through a broken skin than through a sound skin. Any sheep that require dagging should be attended to in order to keep the dipping-fluid as clean as possible. Sheep should not be rushed away to the paddock as soon as they have been dipped; they should be allowed to rest and recover from the shock of sudden immersion in the dipping-fluid.

Extra care is necessary when dipping rams. They should not be dipped during the mating season, as they are then in high condition and therefore more susceptible to injuries and chills. Keenness for service is often affected, with the result that the lambing percentage suffers.

BANKS PENINSULA PASTURES AND TOP-DRESSING.

R. McGILLIVRAY, Fields Superintendent, Christchurch.

THE locality known as Banks Peninsula consists of an area of about 200,000 acres of volcanic hills overlaid on the western slopes by wind-borne soil. In the western portion of the district the tussock covering is still prominent in most places. On most other parts of the Peninsula there has been a striking establishment of cocksfoot, and in many parts it has developed so strongly as to give little opportunity for the growth of other pasture species. In a few places, however, tall fescue (*Festuca elatior*) and tall oat grass (*Avena elatior*) have found an opening, and on some of the sunny slopes of the more exposed hills danthonia is a strong invader, and *Poa pratensis* is also met with in places suitable for its growth.

Owing to the steepness of much of the Peninsula country, even grazing throughout the year is out of the question. It is inevitable, therefore, that the pasturage on extensive areas will get beyond the animals at the time of greatest pasture-production, and much of it will become too mature for best grazing results to be obtained. Cocksfoot pastures are of great importance to Peninsula farmers. Dairy stock turned out for the winter on the rough cocksfoot areas generally come through to the spring in good condition so long as the stocking is not too heavy.

The opinion of prominent farmers is that their stock winter better in this way than when they have attempted to hand-feed them during the winter period on the hay available, but it is always advisable to have some hay on hand for early spring use.

Despite the importance of the cocksfoot pastures on the more broken types of country, one can state definitely that there are considerable areas, especially on the lower slopes, eminently suitable for the establishment of good permanent mixed pastures consisting of true perennial rye-grass, white clover, and other desirable pasture constituents. Farmers on the whole, however, are not enthusiastic about ploughing for the purpose of laying down new pastures, as their experience where this has been done has not been such as to give general encouragement to such practice. Farmers who have undertaken such sowings have often found that they have not come up to expectation, and that they have proved inferior in sward and production to their cocksfoot pastures. If, however, the land where these new pastures were laid down had been limed, and fertilizers applied, and good types of rye-grass, &c., had been sown, results would probably have been quite different, as there is no reason why satisfactory pasture-establishment, a good sward, and high production should not be obtained in a favoured district like Banks Peninsula.

Liming is important on Peninsula soils, but the cost of application to hilly country is high, and that has prevented the wide adoption of the practice. Superphosphate applied as a pasture top-dressing on unlimed land has often proved unsatisfactory, and

in places no response whatsoever has been secured from super dressings. Basic-slag applications have given good results, and where lime is not available applications of slag must receive favourable consideration in any top-dressing work. Basic slag produces a most pleasing, dense dark-green pasture, consisting at times, however, of a preponderance of clovers. This latter feature has not, however, been very noticeable on the Peninsula pastures on which it has been used, but it was apparent on some of the departmental experiments. Superphosphate on limed land has proved satisfactory, and when the position is considered carefully, one would be safe to say that superphosphate plus lime applications will give as good results as basic slag, and produce slightly more growth, especially of cocksfoot. The lime applications, however, are vital if the best results are to be attained with superphosphate.

Observational top-dressing experiments were laid down on a number of farms on the Peninsula in 1927, and in the *N.Z. Journal of Agriculture*, Vol. XLI, page 388, will be found an article by Messrs. Hudson and Montgomery on the results of the experiments conducted by the Fields Division on Banks Peninsula, from 1927 to 1930. Readers are referred to this article for the earlier results of these experiments.

The statement made in this article—namely, that few farmers use fertilizers—still holds good, but the number making use of fertilizers has increased considerably, and of quite recent times decidedly more interest has been shown in the question of suitable fertilizers for pasture top-dressing purposes.

The seed-certification scheme of the Department of Agriculture and the activities of the Akaroa Cocksfoot Seedgrowers' Association have caused an impetus in cocksfoot-seed growing, and if the demand for seed is maintained the question of top-dressing the seed areas even on relatively steep country must receive serious consideration, as intensive seed-production cannot be maintained indefinitely without the use of suitable fertilizers.

The Peninsula soils have been highly productive, but deterioration of pastures has been evident for many years past. This, in the natural course of events, was to be expected in country settled as early as were parts of the district under review, especially when top-dressing was not considered until recent times, and where even yet it is only in its infancy.

The first departmental trials were laid down in 1927 on ten farms, and several of these trials were kept going until 1933, some not being finalized until 1934. For the layout of these experiments readers are referred to Vol. XLI of the *N.Z. Journal of Agriculture*, page 389. The report by Messrs. Hudson and Montgomery contains information as to results up till 1930, but further information largely of a confirmative nature was obtained from observations taken on some of the experiments up till the abandonment of the trials in 1934, and it is proposed to comment briefly on the four experiments that have been under observation until recently.

J. G. Waller, Okuti Valley.—Lime response very noticeable, and of the fertilizers basic slag gave the best results, but during late autumn and early spring ephos phosphate gave a sward almost equal to basic slag. The other fertilizers were largely ineffective.

Kay Bros., Duvauchelle.—A particularly good response to lime and applications of phosphates was noted. The limed portions were more closely grazed than the unlimed. Superphosphate gave excellent results on limed land. Basic-slag results were good, especially on the limed land, but production was hardly as high as on the superphosphate-lime plots, where there was a particularly well-balanced pasture.

T. Wakelin, Duvauchelle.—A distinct lime response was noticeable, and on the limed land both superphosphate and basic slag gave results that could be considered as payable. The superphosphate plots did not show the same amount of clover as the slag plots.

A. Orme, Robinson's Bay.—A good lime response, and all phosphates on limed land gave responses of varying degree. Potash showed a definite response when used with lime and superphosphate. The response was shown in the clover growth, which was very vigorous, and the grazing was very close. Of the phosphates, superphosphate and basic slag can be considered as equal in response on the limed land, but slag was better than superphosphate on the unlimed land.

During visits to the various experiments it was possible to take observations at all seasons of the year and to observe the grazing preferences shown by stock, and the effect of such grazing on the pastures. In all cases close grazing induced a close and leafy sward that invariably appeared to be extremely palatable. In these trials, and especially in the later stages, basic-slag dressings produced the type of pasture mentioned, but superphosphate on limed land was a good second, and in all cases there was to some extent greater production from the superphosphate-lime combination.

Present indications are that the day of almost general top-dressing on the Peninsula is at hand. The importance of the enrichment of the soil with fertilizers is now becoming fully appreciated, and there is some indication that farmers are realizing the necessity of top-dressing their pastures for general farming purposes and also for seed-production.

GOVERNMENT OFFICIAL HERD-TESTING OF PUREBRED DAIRY COWS.

SUMMARY OF THE 1933–34 SEASON'S WORK.

W. M. SINGLETON, Director of the Dairy Division, Wellington.

THE Government Official Herd Test has now completed seven years' operation, and during that period some 12,733 statements of yield have been issued to breeders for cows tested under this system. The Official Herd Test summary is based on the year ending 30th September, some 2,185 cows having been tested during the period under review—an increase of 493 over the preceding year's total of 1,692 cows. There was also a marked increase in the number of herds, the figure for 1933–34 being 184, as compared with 163 for 1932-33. It is also pleasing to be able to record an increase of 2·12 lb. butterfat

in average production, last year's average having reached the creditable level of 311·90 lb., as against 309·78 for the previous year. It will be noted from Table 1 that the average milking period declined by three days, being 280 for the past year, as compared with 283 for 1932–33.

From the point of view of the breeds, the special feature is the marked increase in the number of Friesians placed under test. The Jerseys have also increased considerably, and in view of the large number of cows tested the average production for the breed of 324·72 lb. fat must be regarded as very satisfactory.

The production figures already quoted, together with those in the accompanying tables, are on the basis of all cows in milk 180 days or more, this being regarded as the most satisfactory classification for purposes of this summary.

In addition to registered purebreds, a certain number of grade cows are tested each year, these being odd cows in the herds of testing breeders. Last year the number of such cows was thirty-two, as compared with forty-nine the preceding year. The records of these cows are not taken into consideration in the tables. The number of registered purebred animals which did not remain on test 180 days was 158.

The following statistics will enable an interesting comparison to be made between Government Official Herd Test results and those for other systems in operation in the Dominion: New Zealand's average herd-tested cow for 1933–34, including all cows in milk 100 days or more, yielded 262·44 lb. butterfat in 255 days. The Official Herd Test average on the same basis works out at 306·13 lb. fat in 276 days. The Certificate-of-Record 305-day test average was 447·35 lb., and the Certificate-of-Record 365-day test, 523·10 lb.

Table 1.—Official Herd-testing in Two Past Seasons on Basis of all Cows on Test for 180 Days or more.

Breed.	Number of Breeders.	Number of Cows.	Average Yield for Season.		
			Days.	Milk.	Butterfat.
Season 1932–33.					
Jersey	132	1,087	284	5,988·6	320·44
Friesian	20	253	280	8,506·0	301·91
Ayrshire	2	31	284	5,957·4	233·28
Milking Shorthorn ..	7	125	275	6,623·8	265·39
Red Poll	2	29	297	6,209·8	251·81
Totals	163	1,525	283	6,461·9	309·78
Season 1933–34.					
Jersey	152	1,393	282	5,998·0	324·72
Friesian	18	399	281	8,070·6	283·53
Milking Shorthorn ..	7	142	275	7,341·4	294·93
Ayrshire	2	25	253	6,430·3	265·14
Red Poll	2	25	251	5,227·9	209·19
Guernsey	1	5	275	6,113·9	310·25
Shorthorn	1	6	301	6,367·4	248·17
Totals and averages	179*	1,995	280	6,505·3	311·90

* Totals do not agree for the reason that some breeders tested more than one breed.

Table 2.—Average Production in Classes and Breeds for all O.H.T. Cows.

Class.		Season 1932–33.				Season 1933–34.			
		Number of Cows.	Average Days.	Average Milk.	Average Butterfat.	Number of Cows.	Average Days.	Average Milk.	Average Butterfat.
				lb.	lb.			lb.	lb.
Jersey	Two-year-old and under ..	462	283	5,365·9	290·57	561	283	5,383·4	292·85
	Three-year-old	179	282	5,925·7	318·47	258	286	6,196·0	339·64
	Four-year-old	161	286	6,479·8	345·72	210	279	6,358·0	344·65
	Mature	285	285	6,760·1	355·81	364	280	6,597·1	351·77
Friesian	Two-year-old and under ..	56	281	7,139·7	252·96	155	282	6,619·6	230·47
	Three-year-old	49	281	8,400·1	297·54	55	279	7,975·8	285·48
	Four-year-old	47	281	9,293·2	330·18	75	281	9,009·0	314·24
	Mature	101	278	8,948·6	318·03	114	282	9,471·6	334·54
Milking Shorthorn	Two-year-old and under ..	34	270	5,005·5	205·72	40	272	6,183·5	251·12
	Three-year-old	21	275	6,431·8	262·16	22	273	6,736·3	275·68
	Four-year-old	21	281	7,194·5	291·27	24	268	7,054·1	285·24
	Mature	49	276	7,584·3	297·09	56	281	8,529·3	337·92
Ayrshire	Two-year-old and under ..	18	285	5,439·7	214·54	16	253	6,088·7	252·31
	Three-year-old	6	288	6,434·0	257·00	6	240	6,595·7	263·50
	Four-year-old	2	305	6,504·3	239·15	1	222	6,310·2	279·15
	Mature	5	268	7,030·6	269·93	2	305	8,727·0	365·63
Red Poll	Two-year-old and under ..	9	305	5,151·9	210·28	14	239	4,535·2	180·54
	Three-year-old	5	305	5,589·3	223·40	5	274	5,830·8	235·60
	Four-year-old	7	299	7,063·8	293·76	4	253	5,626·7	220·09
	Mature	8	284	7,040·6	279·59	2	280	7,772·4	321·86
Guernsey	Two-year-old and under ..	Not represented				..	..	..	..
	Three-year-old					1	216	4,141·9	216·00
	Four-year-old					2	305	6,366·2	327·21
	Mature					2	276	6,847·6	340·43
Shorthorn	Two-year-old and under ..	Not represented				3	298	5,429·6	209·32
	Three-year-old					1	305	6,010·2	264·95
	Four-year-old					..	..	..	..
	Mature					2	305	7,952·8	298·07

THE OFFICIAL SEED-TESTING STATION.

RECORD OF TESTING OPERATIONS FOR YEAR 1933.

NELSON R. FOY, Seed Analyst, Plant Research Station, Palmerston North.

FOR the calendar year 1933 17,122 seed-samples were tested at the Department's Seed-testing Station at Palmerston North. This total represents an increase of 3,205 on the number tested during the previous year, the increase being due largely to the very considerable number of trade samples of rye-grass submitted during September, October, and November.

Tables 1, 2, and 3 show the distribution, origin, classification, &c., of the various commercial samples received.

With the exception of the rye-grasses, root, forage, and vegetable seeds, all tests were made according to the rules prescribed by the International Seed-Testing Association. For those seeds excepted above, samples were, on request, tested for germination only: of these most of the rye-grass samples represented farmers' dressed, and these were "dressed" prior to testing and reported as being "germinated on a machine-dressed basis."

PURITY.

In none of the grasses and clovers were there marked deviations in average purity from general standards. The percentage of samples in which seeds of noxious weeds occurred and the rate of occurrence are shown in Table 9. The percentage of samples in which ergot was recorded is presented in the same table.

GERMINATION CAPACITY.

Generally, germination capacity was up to standard. The average figures for perennial rye-grass were not markedly different from those for the previous year. Hawke's Bay, Poverty Bay, North and Mid Canterbury, and Central Otago still stand as the most favourable production districts for rye-grass so far as germination is concerned. Manawatu was slightly above average for that district, while the averages for the southern districts were consistently low.

ULTRA-VIOLET-LIGHT EXAMINATION OF RYE-GRASS SEEDLINGS.

For New Zealand seed the ultra-voilet-light method of examination continues to give satisfactory results in the identification of lines of relatively superior type, and is employed as a check test on samples of all lines of certified perennial rye-grass and for the classification as "perennial" of commercial samples submitted by the trade and growers.

Tabulated results of the examinations for the last-named samples are presented in Table 8. The A classes represent perennial and the B classes false-perennial types, A1 and B4 representing the two extremes in the perennial scale.

Average percentages of purity and germination capacity for all grass and clover species are presented in Tables 4, 5, 6, and 7, which are self-explanatory.

GERMINATION CAPACITY OF CEREALS, VEGETABLES, FIELD ROOTS, ETC.

The average germination capacity for samples of cereals, field roots, vegetables, and flower-seeds are as follow :—

Cereals, &c.

	Per Cent.		Per Cent.		Per Cent.
Oats	75	Rye-corn	74	Blue lupin	89
Wheat	94	Maize	91	Flax (*Linum*)	85
Barley	90	Japanese Millet	92		

Vegetables.

Asparagus	94	Corn	95	Parsley	57
Beet	94	Cress	97	Parsnip	43
Beans	95	Cucumber	87	Pumpkin	86
Broccoli	86	Lettuce	93	Radish	84
Cabbage	78	Leek	72	Rhubarb	72
Cauliflower	76	Marrow	89	Spinach	45
Carrot	65	Melon	83	Squash	91
Celery	83	Onion	77	Tomato	89

Roots and Forages.

Swede	90	Kale	87	Mangel	85
Turnip	92	Carrot	65	Mustard	95
Rape	89				

Flowers.

Aster	60	Marigold	52	Stock	56
Anemone	38	Phlox	57	Ranunculus	3
Cosmos	50	Salvia	57	Verbena	35
Delphinium	82	Sweet peas	80		

Forest Trees.

Cupressus macrocarpa	9	Eucalyptus	88	*Pinus radiata*	67
Douglas fir	63				

The assistance of Mr. J. Watt in the compilation of the tabulations used in this report is cordially acknowledged.

Table 1.—Origin and Classification of Total Samples, 1933 and 1932.

Origin.	Purity only.		Purity and Germination.		Germination only.		Ultra-violet Light.		Total.
	1933.	1932.	1933.	1932.	1933.	1932.	1933.	1932.	1933.
Seed-merchants	**224**	84	**8,058**	5,152	**4,190**	3,660	**328**	215	**12,800**
Seed-growers and farmers	**3**	1	**167**	159	**61**	76	**33**	16	**264**
Department of Agriculture—									
Fields Division—									
General	**12**	2	**123**	93	**67**	130	**50**	36	**252**
Stores purchasing	**1**	..	**362**	461	**107**	133	..	..	**470**
Plant Research Station	..	5	**41**	47	**354**	645	**1,399**	1,130	**1,794**
Seed-testing Station	**2**	189	**120**	18	**1,338**	991	..	498	**1,460**
Other Government Departments	..	1	**68**	29	..	3	**14**	..	**82**
Totals	**242**	282	**8,939**	5,959	**6,117**	5,638	**1,824**	1,895	**17,122**

Note re *Table 1.*—Opposite "Seed-testing Station," the 1,460 samples tested consisted of 990 tests in connection with the investigational work on hand, 332 samples check tests (technique), and 146 sample retests.

Table 2.—Number of Commercial Samples from Land Districts and Centres therein, 1933 and 1932.

South Island.	1933.	1932.	North Island.	1933.	1932.
Southland (total) ..	2,887	2,370	Wellington (total) ..	3,327	2,193
Gore	1,608	1,466	City	1,502	809
Invercargill ..	1,219	874	Palmerston North and Feilding	1,420	1,033
Other	60	30	Other	405	351
Otago (total) ..	1,225	849	Hawke's Bay ..	903	645
Dunedin	1,010	719	Gisborne	360	229
Other	215	130	Taranaki	320	438
Canterbury (total) ..	2,515	1,409	Auckland (total) ..	1,016	716
Christchurch ..	1,440	843	City	968	651
Other	1,075	566	Other	48	65
Marlborough ..	179	200	North Auckland ..	56	49
Nelson	12	13			
Total, South Island	6,818	4,841	Total, North Island	5,982	4,270

Table 3.—Number of Commercial Samples tested of the various Species of Grasses and Clovers, 1933 and 1932.

Species.	Number.		Species.	Number.	
	1933.	1932.		1933.	1932.
Grasses—			Clovers—		
Perennial rye-grass ..	4,005	2,281	White clover ..	778	400
Italian rye-grass ..	571	210	Red clover ..	512	307
Western Wolths rye-grass	200	113	Alsike	71	61
Cocksfoot ..	443	370	Alsike and white clover	17	17
Crested dogstail ..	907	543	Subterranean clover	40	17
Chewings fescue ..	985	951	Strawberry clover ..	6	9
Brown-top ..	380	375	Crimson clover ..	20	11
Danthonia spp. ..	45	41	Suckling clover ..	84	30
Timothy	84	72	Lucerne	110	121
Fog	70	53	Trefoil	28	20
Meadow fescue ..	17	20	Lotus major ..	82	48
Meadow foxtail ..	33	25	Lotus hispidus ..	10	1
Paspalum ..	70	94	Other clovers, &c. ..	30	7
Poa pratensis ..	34	32			
Poa trivialis ..	12	7		1,788	1,049
Prairie grass ..	31	20			
Red-top	3	2			
Miscellaneous grasses ..	25	18	Cereals, vegetables, &c.—		
			Oats	117	109
	7,915	5,227	Wheat	71	65
			Barley	81	60
Roots and other forages—			Rye-corn	2	3
			Vetches	1	7
Swede	247	207	Peas (garden and field)	265	308
Turnip	369	326	Japanese millet ..	15	11
Rape	148	90	Vegetables ..	462	561
Kale	105	99	Flower-seeds ..	41	18
Mustard	23	24	Forest-tree seeds ..	7	8
Mangel	186	206	Seed mixtures ..	10	32
Carrot (field and garden)	104	137	Miscellaneous ..	36	7
	1,182	1,079		1,108	1,189

Table 4.—Average Percentages of Purity and Germination Capacity for Certified Grass-seed, 1933 (officially drawn Samples).

	Purity.				Germination Capacity.					
	Average Percentage.				Average Percentage.	Percentage of Samples germinating, in Groups.			Average Percentage of Pure Germinating Seed.	Number of Samples.
	Pure Seed.	Other Crop Seed.	Weed-seed.	Inert Matter.		Below 80.	80–90.	90–100.		
Certified perennial rye-grass—										
All samples ..	98·8	0·2	0·6	0·4	92	10	10	80	91	1,315
Southland-grown	99·1	0·1	0·5	0·3	56	86	14	..	55	28
Otago ..	97·9	0·4	0·8	0·9	84	24	34	42	82	12
Central Otago ..	98·9	0·1	0·6	0·4	97	..	7	93	96	27
North Otago ..	99·3	0·1	0·3	0·3	76	49	21	30	75	24
South Canterbury	99·4	0·1	0·3	0·2	81	36	32	32	80	75
Mid-Canterbury	98·7	0·1	0·4	0·8	92	8	6	86	91	35
North Canterbury	99·2	0·1	0·4	0·3	91	9	18	73	92	128
Nelson and Marlborough	97·7	0·2	0·7	1·4	93	7	13	80	91	15
Wairarapa ..	98·4	0·5	0·7	0·4	92	7	21	72	90	28
Manawatu ..	99·0	0·2	0·6	0·2	81	34	34	32	80	102
Wanganui ..	97·0	1·0	0·8	1·2	78	44	37	19	76	16
Hawke's Bay ..	98·8	0·2	0·7	0·3	97	..	2	98	96	558
Poverty Bay ..	98·4	0·4	0·8	0·4	96	3	4	93	94	269
Auckland ..	99·0	Nil	0·1	0·9	86	..	100	..	85	1
Certified brown-top	98·9	Trace	0·1	1·0	91	4	14	82	90	98
Certified cocksfoot—										
All samples ..	82·6	2·3	0·3	14·8	89	8	30	62	74	50
Akaroa-grown..	80·6	2·7	0·4	16·3	88	12	27	61	71	33
Canterbury-grown	86·4	1·5	0·2	11·9	92	..	35	65	79	17

Table 5.—Average Percentages of Purity and Germination Capacity for Grass-seed other than Certified Seed.

	Purity.				Germination Capacity.					
	Average Percentage.				Average Percentage.	Percentage of Samples germinating, in Groups.			Average Percentage of Pure Germinating Seed.	Number of Samples.
	Pure Seed.	Other Crop Seed.	Weed-seed.	Inert Matter.		Below 80.	80–90.	90–100.		
Cocksfoot ..	79·2	3·1	0·8	16·9	85	20	34	46	68	443
Brown-top ..	96·7	Trace	0·2	3·1	90	12	23	65	87	380
Perennial rye-grass	98·2	0·6	0·7	0·5	90	15	15	70	88	2,394
Italian rye-grass ..	99·2	0·1	0·4	0·3	93	4	16	80	92	368
Western Wolths rye-grass	99·2	0·1	0·4	0·3	89	9	16	75	88	57
Crested dogstail ..	98·2	1·1	0·4	0·3	82	32	16	52	80	907
Chewings fescue ..	98·2	0·6	0·3	0·9	89	16	8	76	87	985
Danthonia spp. ..	62·5	3·2	16·7	17·6	61	80	20	..	38	45
Meadow fescue ..	98·8	0·1	0·3	0·8	79	24	18	58	78	17
Meadow foxtail ..	59·0	1·8	1·8	37·4	68	61	33	6	40	33
Paspalum ..	59·8	Trace	0·2	40·0	75	36	53	11	51	70
Poa pratensis ..	83·5	Trace	0·2	16·3	86	15	32	53	71	34
Prairie grass ..	95·8	0·3	0·3	6·7	70	54	23	23	67	31
Timothy ..	99·5	0·2	0·1	0·2	94	1	5	94	93	84
Yarrow ..	90·3	1·7	2·4	5·6	79	23	33	44	72	21
Yorkshire fog ..	88·5	8·2	1·9	1·4	89	5	39	56	76	70

Table 6.—Average Germination Percentages for Commercial Samples of Rye-grass tested for Germination only, 1933.

	Average Percentage of Germination.	Percentage of Samples germinating, in Groups.			Number of Samples.
		Below 80.	80–90.	90–100.	
Permanent rye-grass—					
All samples ..	**82**	27	27	46	1,611
Southern-grown ..	**80**	30	32	38	851
Canterbury-grown ..	**86**	23	20	57	323
Manawatu-grown ..	**75**	42	33	25	185
Hawke's-Bay-grown	**94**	7	5	88	116
Poverty-Bay-grown	**88**	18	4	78	54
Italian rye-grass ..	**92**	5	20	75	203
Western Wolths rye-grass	**90**	11	23	66	143

Table 7.—Average Percentages of Purity and Germination Capacity of Samples of Clover and Related Species, 1933.

	Purity Percentages.				Germination Capacity.				Percentage of Hard Seed.	Average Percentage of Pure Germinating Seed.	Number of Samples.
	Pure Seed.	Other Crop Seed.	Weed-seed.	Inert Matter.	Average Percentage.	Percentage of Samples germinating, in Groups.					
						Below 80.	80–90.	90–100.			
White clover—											
All samples ..	**88·7**	8·8	1·8	0·7	**84**	28	25	47	12	**79**	778
All certified ..	**89·5**	8·3	0·8	1·4	**89**	21	17	62	8	**80**	63
Hawke's Bay grown	**87·5**	9·9	1·2	1·4	**92**	6	15	79	4	**82**	47
Canterbury-grown	**92·9**	4·8	0·4	1·9	**78**	54	37	9	18	**79**	11
Other districts ..	**77·4**	1·9	0·4	0·3	**79**	80	..	20	15	**81**	5
Red clover—											
All samples ..	**98·9**	0·2	0·3	0·6	**89**	8	29	63	7	**92**	512
Certified ..	**99·4**	0·6	0·4	1·6	**82**	33	67	..	15	**85**	44
Alsike	**97·3**	1·9	0·4	0·4	**76**	34	28	38	4	**75**	71
Subterranean clover	**98·6**	0·4	0·3	0·7	**75**	68	30	2	18	**80**	40
Strawberry clover	**98·0**	Trace	0·2	1·8	**89**	16	84	..	2	**88**	6
Crimson clover ..	**98·1**	0·2	0·3	1·4	**72**	45	10	45	Nil	**72**	20
Suckling clover ..	**83·0**	13·2	3·3	0·5	**57**	86	8	6	32	**56**	84
Lucerne ..	**98·5**	0·7	0·2	0·6	**77**	44	30	26	18	**85**	110
Trefoil	**99·1**	0·2	0·2	0·5	**68**	60	29	11	3	**65**	28
Lotus major ..	**92·5**	6·0	1·0	0·5	**74**	51	39	10	10	**71**	82

Table 8.—Number and Classification of Samples of Rye-grass examined under Ultra-violet Light.

Classification.	Seed Trade.		Farmers.		Total.	
	Number of Samples.	Percentage of Samples.	Number of Samples.	Percentage of Samples.	Number of Samples.	Percentage of Samples.
A1 ..	103	31	3	9	106	30
A2 ..	126	38	10	31	136	39
A3 ..	41	12	5	15	46	12
B1 ..	25	8	6	18	31	8
B2 ..	12	4	3	9	15	4
B3 ..	9	3	5	15	14	4
B4 ..	12	4	1	3	13	3
Total..	328	..	33	..	361	..

Table 9.—Percentage of Samples containing Approximate Rate of Occurrence of Seeds of Noxious Weeds and of Ergot.

Seed.	Percentage of Samples.	Seeds per Ounce.	Seed.	Percentage of Samples.	Seeds per Ounce.
			Cirsium arvense (Californian thistle).		
Rye-grass ..	1	1– 6	Red clover ..	1	2– 3
Chewings fescue ..	1	1– 2	Alsike	6	1– 3
Crested dogstail ..	14	1–60	Alsike and white clover	6	1– 3
Cocksfoot ..	7	1–10			
Timothy	1	1– 3	Suckling clover ..	1	2–12
White clover ..	1	1– 2	Lotus major ..	5	2–10
			Cuscuta spp. (clover dodder).		
White clover ..	1	1–40	Lotus major ..	11	3–98
Red clover ..	1	2–10	Lotus hispidus ..	20	3–20
			Senecio Jacobaea (ragwort).		
Brown-top ..	4	2–160	Lotus major ..	12	2–30
			Chrysanthemum leucanthemum (ox-eye daisy).		
Timothy	4	1– 3	Yorkshire fog ..	1	1– 5
			Claviceps purpurea (Ergot sclerotia).		
Rye-grass ..	14	..	Yorkshire fog ..	27	..
Chewings fescue ..	4	..	White clover ..	15	..
Crested dogstail ..	20	..	Red clover ..	12	..
Cocksfoot ..	7	..	Alsike	1	..
Brown-top ..	84	..	Alsike and white clover	24	..
Danthonia ..	2	..			
Poa pratensis ..	6	..	Suckling clover ..	11	..
Prairie-grass ..	3	..	Lucerne	2	
Timothy	9	..	Lotus major ..	6	..
			Lotus hispidus ..	40	..

DOMINION POTATO CROPS.

The table below relative to the potato crops in the last two seasons has been compiled by the Census and Statistics Office :—

	Area in Potatoes.	Yield of Potatoes.			
		Table.	Seed.	Pig.	Total.
1933–34	25,028	86,995	28,901	15,149	131,045
1932–33	24,605	77,629	33,891	17,559	129,079

The figures are in respect of all holdings of 1 acre or over situated outside borough boundaries. In the 1933–34 season 14,242 acres, of a total yield of 73,324 tons, were grown in Canterbury.

An increasing interest is being taken in grape-growing in the Dominion, both for table and wine-making purposes. New-Zealand-made wines are gradually coming more into favour, and there is an indication of the demand reaching considerable dimensions in the near future. The season's output of wine is estimated at 138,150 gallons, a substantial increase on the previous year's figures, and represents a wholesale value of £48,352.

PRACTICES IN THE USE OF BLUE LUPINS FOR FEED, SEED, AND GREEN MANURE.

Fields Division, Department of Agriculture.

An introductory article by Mr. R. McGillivray on the use of blue lupins (*Lupinus angustifolius*) in Canterbury was published in the *Journal of Agriculture* for July, 1934 (p. 41). A further article describing the experience of Mr. W. Hammond, Winchmore, and written by Mr. A. H. Flay, Lincoln College, was published in the *Journal* for November, 1934 (p. 289).

In order to procure definite information relative to practices adopted by farmers and to get their opinions on the value of lupins for the purposes for which they were used, information was collected by means of a questionnaire. Twenty-one farmers supplied information which is summarized below. Of the twenty-one farmers sixteen are in Canterbury and five in Southland. Fifteen of the sixteen Canterbury farmers have grown lupins for periods of from four to ten years and one of them for one year only. Four of the Southland growers had one year's experience only, and one had grown lupins for seven years, but for feeding purposes for only one year.

Lupins for feeding Stock.

Number of Farmers feeding Lupins.—Twenty farmers supplied information relative to the feeding of sheep and/or lambs on lupins, fifteen being in Canterbury and five in Southland. Of those supplying information none had used the crop for feeding cattle.

Class of Land.—With the exception of one Canterbury and four Southland farmers who have grown lupins on what is described as heavy land, the crop has been confined to light to medium soils, some of which are described as good wheat land.

Accompanying Crops.—In all cases where feeding has been the objective lupins have been grown in association with some other crop or crops as indicated below.

Number of Farmers.*	Accompanying Crop.
4	Grass†.
3	Rape, turnips, and grass.
1	Rape, turnips, and kale.
5	Turnips.
8	Rape.
2	Oats and grass.
2	Oats.

Width of Row and Rates of Seeding.—Sowing the lupins in 14 in. rows with rape, turnips, or kale sown from the intermediate coulters is the more common method where these crops are in association, giving rows of lupins alternating with rows of the other crop, every coulter being used to sow one or the other. In some cases, however, both lupins and the accompanying crops are being sown down every coulter, the

* Several farmers gave alternative methods, so that the total number shown above is greater than the number of farmers submitting information.

† Whether perennial or Italian rye-grass is not stated. It is known, however, that a number of farmers are sowing lupins along with perennial rye-grass pastures.

grass-seed being broadcast where it is sown as well. Rates of seeding ranged from ½ to 2 bushels per acre, 1½ bushels being a favoured rate.

Manuring.—Fourteen growers supplied information on manuring. Seven use super at 1 cwt. per acre; three use a mixture of super and lime (equal parts) at 1 cwt. to 3 cwt. per acre; and four state that the manuring is as for the accompanying crop.

Times of Sowing and Times when ready for Feeding.—The most popular times of sowing are from September to December, although a good proportion of growers sow also in January and some during February, March, and April. In respect of autumn sowing one farmer comments as follows: "Lupins sown later than March are apt to catch early frosts, and lupins in the early seedling stage are very susceptible to frost injury. When in full leaf they will withstand hard frosts."

The various months of sowing, together with the probable times when the crop will be ready for feeding green and in the pod stage (see "Stage of Feeding" below) as indicated by the information supplied, are shown in the following table:—

Month of Sowing	Ready for Feeding.	
	Green.	In Pod Stage.
September	January	February–March.
October	January	March–April.
November	February.. ..	April–May.
December	March–April ..	May.
January	May–June ..	*
February-March–April	September†–October	December.

* Very little information available.

† Flay (this *Journal*, Nov., 1934, p. 289) reports lupins sown in February as in the "full-leaf" stage in June and July. They commenced flowering in September.

Obviously the rapidity of growth will be influenced by soil and climate, and the above must be regarded as approximate only.

Stage of Feeding.—Eleven farmers feed in the pod stage only. Apparently the stocking of the crop commences when the lower pods are yellow and the seed firm but not hard. Four commence feeding before flowering and continue during flowering and podding stages; two feed in the green stage only; and one specifies the flowering stage as that at which the crop is fed. Obviously the feeding when pods have formed is the most common.

Class of Sheep fed.—Fourteen growers used the crop for sheep and lambs or sheep and hoggets; two used sheep only, and four, lambs only.

Fattening-qualities.—Thirteen growers expressed opinions regarding the suitability of lupins for fattening lambs. Seven were of the opinion that the crop was suitable for fattening lambs, and five stated that it was not, one indicating the fattening capabilities as "slow."

Eleven opinions on fattening of sheep resulted in eight being favourable for lupins and three unfavourable.

It must be remembered that the lupins were in association with some other crop in each instance. The data did not permit of a determination of the relationship of stage of feeding to fattening capacity. Estimates of the fattening-capacity per acre for sheep ranged from 12 to 47, and for lambs from 12 to 33.

Palatability.—Twelve farmers supplied information on this point. Eleven stated that sheep always ate the accompanying crop in preference to the lupins. One individual's experience was that no preference was shown for either lupins or other crop, and two of the eleven pointed out that sheep used to lupins eat them as readily as they do the accompanying crop, especially in late stage of maturity.

Lupins for "Hay."—Two growers have cut and stacked the crop for winter feed. One states that the crop is cut when ripe, while the other sows with oats and cuts when either the oats or lupins are ripe, depending on which is ripe first.

Trouble with Stock.—Eleven experienced no trouble with stock when fed on lupins. Nine had trouble, and in some cases loss of stock attributed to the lupins. The trouble experienced was most commonly described as "staggers," although one farmer described the symptoms as those of "bloat" and one encountered "scalded feet." The trouble experienced occurred at various stages of maturity of the crop and commenced after the sheep had been on for a few days in some cases, and for several weeks in others. Some farmers whose sheep developed staggers stated that they recovered after they had been removed to a grass paddock for a day or two. Another who has had no trouble considers it necessary to allow sheep free range of an adjoining grass paddock when being fed on lupins.

Growers' Opinions.—The following data indicate the summarized opinions of growers regarding lupins for sheep-feed: 7 farmers, excellent; 5, good; 1, satisfactory; 3, poor*; 4, non-committal.

Lupins for Seed-production.

Sixteen growers of seed supplied information regarding their practices, which in brief are as follow:—

Width of Row and Rate of Seeding.—Practically all sow in 7 in. rows. The rate of seeding ranged from ¾ to 2 bushels per acre, the latter quantity being by far the most common.

Time of Sowing and Harvesting.—Some growers sow in both spring and autumn, the former being the more popular. Eleven recorded sowing in September or October, and harvesting from February to May, but mostly in March and April. Eight, some of whom also sow in the spring, sow from February to April and harvest in December or January.

The crop is viewed as a difficult one to harvest, especially in hot weather, when much seed is lost. Seed shed at harvest is sometimes disked in for a catch crop for feeding in the winter.

Harvesting Methods.—Stacking prior to threshing and after cutting with a side-delivery or reaper and binder was adopted about as frequently as using the header-harvester with a pick-up attachment after windrowing. Two growers used the header-harvester in the standing crop.

Yields.—Estimated yields ranged from 10 to 50 bushels per acre, some individual growers indicating the above range in their own crops. Several emphasized the difficulty of harvesting without appreciable loss of seed.

* All of these were Southland farmers on heavy land. See also "Remarks of Growers."

Lupins for Green Manure.

Eleven growers supplied information relative to practices adopted in growing the crop for green manure.

Method of Sowing and Rate of Seeding were practically the same as for seed-production.

Time of Sowing and Ploughing-in.—With a few exceptions, sowing was done from January to April and the crops ploughed in between May and October. The few exceptions were crops sown from September to November and ploughed in from December to February.

Favourable Remarks by Growers.

C. C. Winn, Lyndhurst.—They are an excellent sheep-feed. Have a marked effect on wool, and ewes lambing off lupins are dropping splendid lambs. Ewes in great buckle. Fully convinced that on medium land such as mine lupin-growing has become a necessity, and the rapid rise in soil-fertility is more than evident.

H. Reesby, Lyndhurst.—Would not be without them. Sheep came through with wonderful bloom.

L. C. Anderson, Lyndhurst.—Never had more safe feed—no losses. First-class sheep-feed, and greatly assists in keeping land in good heart.

W. R. Hammond, Winchmore.—Lupins with 1 bushel of Western Wolths or Italian rye-grass as a winter feed are most decidedly preferable to turnips on this class of country (light to medium stony plains land). Consider that lupins will replace turnips for winter feed on the drier and lighter country. Have had trouble with stock only with lupins in early seedling stage when effect similar to ergot. Had no deaths.

C. G. Jarman, Darfield.—A great soil-improver. Very valuable as a standby in dry autumns and especially valuable for fattening old ewes. I would not advise sowing by themselves as a fodder, as they take a long time to mature, but my experience is that they will grow with rape, kale, and turnips without affecting the growth of such to any great extent.

(Note.—This farmer had serious loss of lambs once only in seven years' growing of lupins.)

H. Wright Johnson, Dunsandel.—I have been growing lupins for ten years for seed, green manure, and sheep-feed mixed with oats and rape. Apart from any value they may have for feeding purposes, I have found them an excellent green manure crop.

M. S. Bower, Swannanoa.—A very valuable plant about which much is yet to be learnt. Very good for green manuring, but its sheep-feeding qualities are yet to be definitely proved according to my experience. Sheep gorging on the seed will die and when forced on to green lupins without other feed. (Note.—This farmer has been growing lupins for six years and reports fifteen to twenty deaths. Presumably these occurred in one year, but point is not clear.)

J. S. Thomson, Kirwee.—Have found them a satisfactory supplementary feed for ewes in autumn when other feed in short supply.

H. M. Marshall, Weedons.—Consider them a valuable winter feed for ewes when sown with turnips. Have had no outstanding results from lupins as a green manure.

W. H. Marshall, Prebbleton.—Consider them an excellent green manure crop. Can grow two consecutive crops of wheat on land where I could grow only one crop previously.

H. Oliver, Hororata.—I intend to try them again. I found that, mixed with rape, lambs did well on them and did not scour. I find wethers on turnips sown along with ½ bushel lupins per acre are doing well and are eating the lupins right down. (This farmer has grown lupins for one season only.)

F. E. Morrish, Springston.—I consider lupins an excellent catch crop for sheep-feed, and would not be without them. Slight staggering in ewes, but no deaths attributable to grazing lupins. I consider wheat does better after rape fed off or peas harvested than after lupins harvested.

H. E. Cross, Sandy Knolls.—So far I have used them principally for green manure, but I am of the opinion that they are a good standby for sheep-feed under dry conditions.

A. E. Cross, Bennetts.—My opinion of lupins is that they are a good soil-builder and a good standby in case of a failure of turnips or rape crops, and now I would not like to be without them.

H. M. McAdam, Invercargill-Glencoe R.D.—So far as my experience goes (one year) I find them first-class feed, and though I had a poor crop and put on too many lambs they improved on them, did not scour, and I had no trouble starting them. (NOTE.—This farmer is on lighter soil than other Southland farmers quoted.)

R. Martin, Otama.—For green-manuring they are very good, but I would not be prepared to give any definite opinion as regards fattening or grazing, as I have only had one season's experience. (NOTE.—This farmer has been growing lupins for seven years. Last season he drafted his lambs and put one hundred on 3 acres lupins and oats for four weeks, after which most of them were prime).

One other farmer whose remarks were favourable failed to reply to a request to publish his remarks. Consequently, they are not included.

UNFAVOURABLE REMARKS BY GROWERS.

D. Marshall, Springston.—Have used mainly for ploughing in prior to grassing down. Recent seasons have been so dry and lupin growth so light that no marked improvement in growth of grass was obtained as a result of ploughing in lupins. Have had as good results with grass following oats fed off.

J. Cochrane, Invercargill-Otahuti R.D.—They do not suit our climatic conditions and do not ripen quickly enough to be of much or any value as a good lamb-feed. Also they are not palatable to stock in the early stages of growth, thus losing what should be the most suitable fattening-feed—*i.e.*, the green leaves. (NOTE.—This farmer tried fattening lambs, but states that he "took them off before they went back.")

A. Moore, Waimatuku.—Not suitable for lamb-fattening in Southland. Problematical whether crop could be harvested successfully in this district, due to its long growing season and high rainfall experienced.

A. H. Hall, Thornbury.—Not suitable for lamb-fattening in Southland. Lambs were not closed on area and lupins were barely touched. (NOTE.—Lupins sown with grass.)

ACKNOWLEDGMENTS.

The information summarized above was collected by Instructors in Agriculture in Canterbury under the direction of Mr. McGillivray, Fields Superintendent, Christchurch; and by Instructors in Southland under the direction of Mr. R. B. Tennent, Director of Fields Division (then Fields Superintendent, Dunedin). Our indebtedness to those farmers who so willingly supplied information is gratefully acknowledged. Thanks are due to the Assistant Crop Experimentalist, Mr. J. W. Woodcock, for analysing the questionnaire.

—*A. W. Hudson, Crop Experimentalist, Plant Research Station, Palmerston North.*

THE IMPORTANCE OF CULTIVATION IN PASTURE ESTABLISHMENT.*

P. W. SMALLFIELD, Fields Superintendent, Department of Agriculture, Auckland.

THERE is nothing new in what follows—every real farmer and gardener realizes the importance of a good seed-bed at sowing-time and understands the principles and practice involved in its preparation. But at the present time there are many farmers inexperienced in cultivation work who are turning their attention to resowing their grasslands with improved strains of grasses and clovers—men whose active experience in farming has only embraced the management of established grass and the care of live-stock.

If we look at farming as it really is, if we examine the pastures that have been sown down during recent years, evidence is soon forthcoming that a great deal of the land sown in grass is not cultivated as well as it ought to be, and many farmers are not securing the full advantage of the improved strains of grasses and clovers they are now using in their grass mixtures.

Reliable strains of grasses and clovers, fertilizers, and lime can be bought ready for use—they are now standardized. Cultivation cannot be bought—it has to be done by the farmer: it is not capable of standardization. It depends on the skill of the operator, his tools (horses and implements), and time. Experience leads to the belief that the most pressing need in grassland improvement at the present time is for research work in cultivation and crop rotations to form the basis for advice to farmers in preparing land for grass.

SEED-BED FOR GRASS.

A good seed-bed for grass should be clean, sweet, moist, fine, and firm at the time of sowing, for these conditions favour rapid and complete establishment of grass and clover plants. Possibly freedom from weeds and aeration are not as important as for annual crops. Grasses and clovers can eventually suppress most undesirable

* Paper presented at 1934 Conference of the New Zealand Grassland Association.

plants, but weed competition at the time of actual establishment is often a disadvantage; aeration in relation to grass and clover establishment is possibly not as important as with annual crops, for both grasses and clovers seem to be more adapted to a settled condition of the soil than cereals or fodder crops. But for grasses and clovers it is essential that the seed-bed be moist, fine, and firm and the seed sown whilst the land is warm.

Moisture and warmth go together. The autumn is normally the best time for pasture establishment, and this necessitates that seed-bed preparation should be accomplished so that the land is moist at the time when the grasses and clovers ought to be sown. With late preparation a dry bed usually results, and sowing has often to be delayed until the late autumn when really heavy rains have sufficiently moistened the land to render it fit for sowing, whereas with a moist bed light rain will bring up the grass and then the reserves of moisture in the soil will be sufficient to carry on the plants

Fineness is important, and should go deeper than surface pulverization — it is the under-part of the seed-bed that should be fine. A fine surface with clods underneath is unfavourable to growth. The clods bridge open spaces and thus prevent the rise of moisture from below. When the clods crumble down, as they ultimately do, the seed-bed lacks the firmness requisite for good growth.

Firmness is essential for the full germination of grasses and clovers: clovers particularly require a really firm seed-bed. Natural settlement before sowing is undoubtedly preferable to artificial consolidation. With the former the soil firms from below up; with the latter the soil is made firmer at the top than below.

The importance of moisture, firmness, and fineness in the seed-bed for grass is nowhere more strikingly seen than in the cultivation of poor land.

The Cultivation of Gum Land.*

The gum-land soils occur in patches right through North Auckland. The soil is a grey silt or a clay on undulating treeless downs rising occasionally into low hills. The surface covering consists of manuka, bracken, fern, and danthonia, and, where the drainage is poor, of swamp vegetation, rushes, and umbrella fern. The surface soil, being deficient in humus, is very sticky in the winter and bakes very hard during the dry summer weather. Cultivation is accordingly difficult and costly, as the land can be ploughed and satisfactorily worked down only in the late autumn and early winter and again in the late spring and early summer. In addition to the low natural fertility of the soil, the grassing of the gum-land areas has been rendered still more difficult by the operations of gum-diggers. The ground was roughly dug up wherever gum was suspected to exist, and a thin layer of topsoil, generally only a couple of inches thick, was buried a foot or more down, and deep holes were dug and left unfilled. But what led to the worst destruction of the soil was the continual burning-off of the covering scrub. The gum-digger did not cut down and clear away the vegetation on the surface of the ground he wished to clear: he resorted to the simple method of "putting a match to it." Fires started to clear a few yards often swept thousands of acres. This repeated burning-off caused every vestige of dark surface-soil to disappear and left a bare clay soil on extensive areas

of gum land. Unpromising it certainly looks in its unimproved state, but experience has shown that with drainage, careful cultivation, the use of perennial strains of grass and clover, and the application of adequate quantities of phosphates and often of lime these unpromising soils can be satisfactorily grassed. Cultivation is very important; without a moist and firm seed-bed and early sowing white clover will not establish, and without white clover rye-grass will not grow. In preparation for grass the best practice is to clear and burn the surface covering, fill holes, and drain wet places, plough in the autumn with a short-breasted plough, leave fallow over the winter, harrow, replough in the spring, and keep the surface harrowed over the summer, and sow grass in February or early March. The two ploughings give an excellent seed-bed—the bottom is firm and moist—firm with natural consolidation, and this firm and moist bed allows of early sowing, and a good grass and clover cover is secured before the winter; and the first grazing can be done before the land is really wet.

How easy it is to write "The two ploughings give an excellent seed-bed." If pens were ploughs and fields were paper, how easy it would be to grass these intractable clays. The land is best twice ploughed. Think of the work for that first ploughing on badly dug-over gum-land clays—where the surface consists of great spits of clay left jumbled together by the gum-digger, shallow and deep holes filled with water, and a profuse growth of rushes. First comes the clearing and burning; then the spade work to drain, to level mounds, and fill holes so that a reasonable surface is prepared for the horses and plough to work on. Then the first ploughing, with the horses slipping and stumbling over clods and through holes, dragging the plough where it would not seem possible for a plough to go. At the first turn over the land looks anything but promising. Rough the ploughing certainly is, with yellow and white furrow slices, devoid of any dark humus, turned always to the weather. But the roughness is an advantage—the ameliorating effects of the air and rain are offered full play: the clods soften as the air and water reach all parts. Time plays its part. The work cannot be hastened; it must be left to the weather. In the spring the land is harrowed and the clods break down. The second ploughing is easier than the first. The plough is the best implement for preparing a seed-bed. This second ploughing provides that necessary pulverization for the bottom of the seed-bed and leaves the land in that moist and firm condition underneath which is so necessary for grass and clover establishment.

The Cultivation of Pumice Land.

Pumice land is light and sandy and the very opposite of the gum-land clays. Yet, like the clays, it is of low natural fertility, and its cultivation, although much easier than the cultivation of the clays, must be properly performed to get a good establishment of grass and clover. Time must be availed of to consolidate the clays, whilst the roller must be used to firm the pumice soils. Open plains of pumice land occur in the central plateaux of the North Island; the porous sandy soil gives rise to semi-arid conditions, and the surface covering consists of tangled scrub and tussock.

In grassing this country the surface covering is first cut and burnt, the land ploughed with a lea-mouldboard plough 5 in. deep (the better the ploughing the easier the subsequent seed-bed preparation), then left fallow for a few months to allow of weathering and aeration and for the furrow slices to close together. The land is then rolled on the furrow with a Cambridge roller, double disked, chain-harrowed to level the surface, rolled before and after seed-sowing.

Rolling on the furrow with the Cambridge roller is important; this rolling consolidates the bottom of the seed-bed and brings the soil moved by the plough again in close contact with the unmoved subsoil, making a continuous firm layer of soil through which moisture may move from the deeper layers to the surface. If pumice land is not consolidated white clover will not establish, and without white clover rye-grass will not grow. This is clearly seen on steep hillsides where the roller cannot be used.

The Cultivation of Peat Land.

Peat land varies considerably in texture and moisture-holding capacity. Some areas have silt with the peat and are reasonably easy to grass; other peat land is composed almost entirely of vegetable matter, contains a waterproofing material, and only becomes wet after months of wet weather. Peat lands are primarily grassed by surface-sowing Yorkshire fog and *Lotus major*, two plants that do well on the land immediately after drainage.

Let us take now a peat swamp of poor quality that has been drained and is now covered in the original Yorkshire fog and *Lotus* pasture, which is to be ploughed and sown in better grass. With loose, poor dry peat, work it how you will with ordinary tillage implements and you cannot get it sufficiently moist and firm for early autumn sowing. Sow early, the establishment is poor and the thinly set grass and clover plants are crowded out with weeds; wait till the land is sufficiently moist and it is too late to sow. Yet with early sowing the strike and establishment may be quite fair near gateways where very heavy consolidation has taken place.

Lessons from the Cultivation of Poor Land.

A good primary establishment is all-important in grassing land of low fertility. If the land will hold moisture and the establishment is good, the pastures can be made by building up the fertility with top-dressing. (Consideration is being given only to high-rainfall districts.) Rye-grass is easier to establish than white clover, but without white clover rye-grass will not grow, top-dress how you will. Unless a good white clover establishment is secured there is the almost certainty of losing the whole cost of cultivation, seed, and fertilizer.

Is the position very different on land of better fertility? How often do we see in newly-sown pastures the improvement in establishment that occurs from accidental causes—the better establishment near gateways and on headlands, in the wheel-marks of tractors or lorries, in the footprints of horses, in the beneficial effect of a fallow where part of a field has been ploughed and fallowed longer than another part.

After establishment, stock and top-dressing make a pasture—with good and early establishment stocking can be earlier and heavier, and

it is no exaggeration to say that a pasture is made or marred in the first six months. It seems probable that many pastures that are now being sown on dairy-farms will turn out to be only 100 lb. to 120 lb. butterfat per acre pastures, whereas with better cultivation and better management they would be capable of producing 175 lb. to 200 lb. of butterfat per acre.

Pasture Establishment on Dairy-farms.

Let us now turn and see how grass is often put in on dairy-farms. A farmer has been cutting his top-dressing somewhat short during recent years and finds he is not now getting the grass-production that will provide sufficient summer grazing and give a surplus large enough for hay and ensilage to keep his stock going during periods of low grass-production. After being caught short one winter he decides to break up a field of his poorest grassland for a crop of swedes for next winter, and, as he has heard much about certified rye-grass, he expects to get a really good pasture when he sows it down later to grass—one that will give a full return for the fertilizer he applies in top-dressing. He ploughs his land early for swedes, for he knows he has to let the turf rot and the land consolidate if he is to get a crop. Now, after the swedes usually one of two things is done—he either takes a green crop or a soft-turnip crop for summer feeding and sows grass almost immediately after ploughing the land following the summer crop, or he leaves the land after the swedes untouched until February or early March, and then ploughs, works down, and sows the grass all within a week or two. With light land the seed-bed is often too loose, for he does not roll on the furrow, because the usual roller requires five horses for rolling on the furrow and he has only three. With heavy land the seed-bed is usually cloddy and loose below because the seed-beed has been hastily prepared. With both types of land the seed-bed is usually dry, and sowing is delayed until some really heavy rains have fallen.

Now, if matters are to be improved certain questions deserve consideration. Are we in the high-rainfall districts to rely wholly on grass for feeding cows? If so (and it is certainly the cheapest and easiest way), then grass is our crop, and all care should be taken in the cultivation for that crop. When it comes to renewing grass my experience is that the best establishment is secured by ploughing old grassland, summer fallowing, and sowing to grass again early in the autumn.

If annual forage crops are to be grown as an essential feature of dairy-cow feeding, are they to be rotated with temporary or long rotation grass? What rotation will give the best results for grass-sowing? (Regular annual forage crops on dairy-farms mean extra labour and equipment. The slogan of "Better Feeding of Dairy Cows" was not taken up as long as better feeding meant annual forage crops, but was quickly incorporated into farm practice when it meant the saving of grass ensilage.)

To come back to cultivation: A dairy-farmer has usually only two or three light draught horses, and the implements used must be adapted to the horse-power. For light land a roller is essential—the land must be rolled in the furrow: the dairy-farmer requires a Cambridge roller 3 ft. 6 in. to 4 ft. wide so that he can roll in the furrow with two horses.

On heavy land pulverization and consolidation should be brought about with the plough. The work that is done on large arable farms with heavy grubbers and Cambridge rollers should be performed with two ploughings, for there is no better pulverizing implement than the plough. At present farmers use the disks to give a superficial pulverization, whereas two ploughings give a complete pulverization and a good bottom to the seed-bed.

Summary.

The seed-bed for grass should be firm, moist, fine, and warm at the time of sowing. These conditions are particularly well emphasized in grassing poor land, on which, if the seed-bed is not exactly correct, the grass may fail completely. Accidental happenings, such as the better strikes secured in tractor or lorry-wheel marks, indicate that the seed-bed for grass, even on good land, is often not as well prepared as it might be. Cultivation operations—their method and time—are intimately connected with farm-management. On dairy-farms the definition of the procedure to get land ready for grass depends on whether farms are to be purely grass farms or whether grass is to be supplemented by annual crops. The actual cultivation of land for grass should be performed thoroughly with implements suited to the horse-power available.

TARANAKI FARMERS' HAY AND SILAGE COMPETITIONS.

SEASON 1933–34.

J. M. Smith, Instructor in Agriculture, Fields Division, New Plymouth.

The judging of the hay and silage classes in the field competitions organized by a committee representing the Taranaki Agricultural Society and the North Taranaki Farmers' Union has now been completed.

The total number of entries in these classes is the largest in the history of the competitions, there being 351, made up as follows: Stack (grass), 103; stack (A.O.V.), 7; stack (hillside), 18; concrete pit, 17; earth pit, 56; hay, 150: total, 351.

This increase indicates the value put on the competitions by farmers throughout the district. As a practical means of gaining experience and of avoiding the mistakes that have been made by others the competitions in these classes do a great work.

Crops.

Ninety-six per cent. of the silage made in Taranaki this season was from pastures, the remaining 4 per cent. being chiefly oats and millet. Very few special crops are grown for the express purpose of making them into silage, but these crops are being employed mainly in the preparation of the ground for permanent pasture, and as a matter of convenience for feeding they are saved as silage. As the area in first-class permanent pasture in Taranaki increases, so will the quantity of silage made from special crops decrease. Farmers

generally recognize that one of the present weaknesses in their pasture management is in the comparatively poor utilization of the peak pasture growth, and there is little doubt that the making of silage is a farming operation that lends itself to the better utilization of surplus grass.

The quality of the raw material governs to a large extent the quality of the resultant silage, for it is impossible to make a high-class silage from an inferior pasture. The actual points allotted for raw material (20) do not indicate truly the influence that the raw material has on the silage, but it must be remembered that the competitions in these classes are for silage and not for pastures, so that to place the proper proportion of points on raw material would unduly favour those farmers with first-class pastures. At the same time, the competitions should encourage the making of some of the best growth on the farm into silage, and not the following of the practice that is in vogue in some districts of making all of the first-class pasture into hay and making silage only from the inferior pasture and weed growths. Such silage cannot be expected to give satisfactory results, particularly with milking-stock.

Stage of Cutting.

Stage of cutting, next to raw material, has the greatest influence on the quality of the silage, and if the competitions have done nothing else but demonstrate the benefits of early cutting, then they have been well worth while. The aim in cutting should be to catch all of the grasses and clovers at their best stage, but the dominant species in the sward should be the guiding factor. In a high-production sward this will probably be the perennial rye-grass. Farmers who have cut pastures for silage in the varying stages of growth are unanimous in their opinion that the best silage results from the crop being cut at a leafy succulent stage. In regard to the quality of the resultant silage there is also a greater margin of safety from mismanagement when the crop is harvested at a leafy stage. During the past season the necessity of having a sappy crop to deal with was brought home in quite a forceful manner. The spring months were, for Taranaki, comparatively dry, only $8\frac{3}{4}$ in. of rain falling during September, October, and November. Just about the time for the growing silage crops to develop we had eighteen consecutive days without rain, and this resulted in a less sappy crop than normally. This in turn was reflected in much of the silage, which, on account of lack of sap, was cured at too high a temperature, and came out of the stack quite dark in colour. This same effect is noticeable where the crop is allowed to go past its best stage for silagemaking.

Despatch in Harvesting.

While it is important to cut the crop at a sappy stage of leaf growth, it is also necessary to get the raw material quickly into the stack so as to conserve the succulence of the growing crop. This rapid harvesting is particularly desirable where the crop has gone past its best stage before cutting. So seized are some of the competitors of the importance of this phase of silagemaking that they actually employ an extra team so that the crop is mown just in front of the

sweeps and it is only a matter of minutes before the material is harvested. While this is doubtless desirable where the team unit is sufficiently large to enable it to be carried out, it is hardly necessary to engage special teams to enable mower and sweep to work at the same time. Nevertheless, the available team should be employed so that the green material does not lie for more than an hour or two at most before being harvested even if it means changing the team from sweep to mower as many as three times in the day. If the weather is at all drying—that is, hot and windy—the wilting of the green material is very rapid and every hour out means an inferior silage. There are times, however, when some wilting is considered advantageous, and one of these is when an extremely sappy crop such as lucerne or oats, &c., is being dealt with. Then, again, if the silage is being made in a pit, the wilting of the first day's filling will obviate that rank sour undesirable silage that one frequently finds at the bottom of a pit. It will be noted that all of these operations—*i.e.*, cutting at a sappy stage and rapid harvesting—aim at a low-temperature silage, and there is little doubt that the competitions have clearly indicated in a practical manner that for milking-stock this comparatively low-temperature silage is the silage at which to aim. This does not mean a dark-green objectionably sour material, but the golden-green fruity type of silage. Investigations into complaints about silage from various sources have invariably led the investigator to an undesirably sour type of silage or to the dark-brown burnt type. At no time has the fruity green type been found responsible for any trouble.

Building the Stack.

There is little to be added to the evidence of previous seasons in regard to building the stack. Continuous building is desirable where mechanical means of hoisting the material are available, but if through force of circumstances it is necessary to fork the material on to the stack, then the resting of the stack between the days of building reduces labour considerably. The round versus the square stack controversy continues to rage, but it is of little moment. If a builder feels more competent to build a square stack, he should do this ; and if, on the other hand, he is more at home with the round stack, let him build a round one. If, however, he is at home with either, then the round stack should prove the better. Again, the keeping of the stack fairly full in the centre is now in favour, but it is advisable to be careful not to overdo this, or a dwarfed wall with large shoulder waste will result. The walls should be firm and upright and should not be sprung—they themselves will do all the springing necessary. Hard raking or hard pulling of the walls is very desirable, but they should not be cut back.

Filling the Pit.

A mistaken idea exists in some quarters that where a hillside pit or concrete pit is being used for the conservation of silage any building of the material can be dispensed with and the grass just thrown in. Such an idea is quite wrong, as many competitors have found to their sorrow. Almost as much care and attention needs to be paid to the building of the material in the pit as is paid to it in the stack. It is an advantage to keep the centre full and in some cases high, but the

walls must be well packed and tramped. A hollow centre draws the material away from the sides as it settles, while a full centre with loose walls means that the sides sink more rapidly than the centre, with the result that they too are drawn away from the walls. Continuous filling of the pit is not altogether advisable in that the temperature rises more slowly in the pit than it does in the stack and rapid filling often results in a too sour silage. Then, again, the matter of building above ground is a decided drawback of the pit, and slow filling means more material can be put into the pit before it is necessary to build above ground. Where it is necessary to build any height above ground-level it will be found an advantage to put a slight bevel on the lip of the pit to ease the passage of the stack portion of the green material into the pit. An alternative to this bevel is to gradually increase the size of the stack as it proceeds above the pit, but this system is leaving too much to chance and the bevel is certainly the surest method. Earth pits continue to be quite satisfactory, providing the walls are smooth and do not crumble unduly. This is where the concrete pits are superior to the earth pits in their degree of permanence. The damp earth wall also creates more mould round the walls of the silage than does the concrete. Another drawback to the earth walls is the amount of damage done by mice.

Covering the Stack.

Temperature is controlled by the exclusion of air, and this takes place in the first and subsequent sections built by the addition of more material on top. Following the last day's harvesting, it is necessary to exclude the air from this section, so some weight is put on top to bring this about. Usually soil is used, although at times boulders, concrete slabs, &c., are employed. Just as continuous building excludes the air and controls the temperature, so should the soil be put on straight away to control the temperature in the top section. The depth of soil will depend upon the weight of soil. For instance, in the Uruti district less heavy silt need be used than in, say, the light pumice soil of Inglewood. As a rule, however, 1 ft. to 18 in. of soil should suffice. The important thing about the soil, however, is to get it right out on to the edges of the stack to ensure good weight on the walls, which should reduce wall waste considerably. Many and varied are the means employed to bring this about, and the palm must go to the Okato district, in which short heavy logs anchored to a central peg are employed. The logs themselves are heavy, and being some 15 in. in diameter allow a big depth of soil to be brought right out. In the case of Mr. H. T. Paul's oat-stack the maximum points for cover were given, it being impossible to suggest any prospective improvement, even in a minute way. Occasionally boulders are used, and these are very successful where the stack is heavily consolidated during building. An example is the case of Mr. L. Marsh's stack at Hillsborough, where the teams actually come up on to the stack with each load, and where a very high degree of consolidation is effected—here the boulders act equally as well as does the soil in other cases. Where consolidation is not all that could be desired, however, boulders sink into the stack causing depressions into which water finds its way, resulting in much waste.

Stack Silage.

Of the 103 entries judged forty-seven gained over 90 points. The Fertilizer Co.'s Cup for this class was won by Mr. H. Jones, Kaimata. This stack was made from a sixteen-year-old pasture composed chiefly

of paspalum at the time of cutting on the 26th January. This paddock was not shut up until December, so that the short quick growth of the paspalum, together with a certain amount of clover that was present, constituted a very fine leafy raw material which was saved in a splendid manner. The stack was a round one, being 21 ft. in diameter and 8 ft. high. It was put in during three consecutive days, the material being cut twice daily. It is interesting to note that the weather was showery at the time, the men working in overcoats for a considerable portion of the time, and this fact, together with the sappy nature of the young paspalum-clover mixture, was no doubt largely responsible for the splendid quality of the silage and the small amount of waste. The soil was put on straight away and was 14 in. in depth, while it was held in place by manure-bags.

Six other competitors scored 94½ points for second place, indicating the closeness of the competition in this class. Mr. W. J. Bridgeman, Okato, had a stack from pasture nine years old cut on the 25th November and harvested in three consecutive days, 18 in. of soil being put on straight away. The material from a three-year-old pasture of Messrs. Clemow Bros., Cardiff, was harvested in six consecutive days during showery weather, and 1 ft. of soil put on straight away, being held out with netting. In the case of Mr. A. N. Mills, Cardiff, an eight-year-old pasture was cut on the 20th December and harvested in four days with one day missed on account of wet weather. Eighteen inches of soil was put on straight away and was held on by poles. Mr. J. Kilsby, Tariki, cut on the 30th January and harvested in three consecutive days from a five-year-old pasture. A foot of soil was put on straight away, was held out with rushes, butts out. Mr. R. B. Sutton, Inglewood, harvested on the 23rd November, putting the material in during four consecutive days, while 15 in. of soil put on straight away was held out by sods. At Uruti Mr. D. S. Musker harvested a twenty-year-old pasture, commencing to cut on the 8th February. It was harvested in four consecutive days, while 1 ft. of soil was put on straight away and held with netting. It is interesting to note the dates of cutting of these various entries, which are as follows: 20th, 23rd, and 25th November, 20th December, 26th and 30th January, and 8th February. This indicates that the season of the year has relatively little to do with the quality of the silage, but the stage at which the crop is cut is the determining factor. The term "early cutting" conveys to some the impression that the material should be cut early in the season, but "early cutting" really means comparatively early in the stage of growth of the crop.

Stack Ensilage (other than Grass).

This class was won by Mr. H. T. Paul, Okato, whose stack scored 97, the highest points yet awarded in the competitions. The crop was oats, and this was cut with the binder on the 3rd and 4th January, and the sheaf-stack built in the same manner as a grain-stack. The stack was 32 ft. in diameter and 7 ft. high. The material was harvested in three consecutive days, and, as the weather was hot and drying, the sheaves were stacked in heaps in the paddock to prevent too much wilting. Two feet of soil was put on straight away, and this was held out by the short logs already referred to.

Mrs. Ashley, Okato, was second in this class with a stack very similar to Mr. Paul's, only the quality and covering was very slightly inferior to the winning stack.

Hillside Stack Silage.

The Blyde Bros. Cup for this class was won by Mr. W. Summers, Tariki, this same competitor being runner up in this class last season. The crop of grass was from a paddock three years old and a start was made with harvesting on the 1st December. Actually fourteen days were occupied in harvesting with odd days missed in between, while the soil was put on straight away.

Concrete-pit Silage.

The competition in this class was exceptionally keen and the high standard of points indicates the fine art that those competitors saving silage by this means have brought this to. Mr. P. A. Openshaw, Lepperton, won the Bell Cup with a total of 96¾ points, while Mr. G. H. Bell, Oakura, and Mr. E. C. Locke, Hillsborough, each scored 96½ points.

Earth-pit Silage.

This class also saw very keen competition, there being more entries than usual. Mr. J. H. Paulger, Tikorangi, won the Clements Cup awarded for earth-pit silage with a total of 96 points, while Mr. E. Mahon, Tariki, scored 95½ points, and Mr. G. B. Knowles, Tariki, Mr. D. S. Musker, Uruti, and Mr. F. Bracegirdle, Kaimata, each received 95 points.

Hay.

This was a particularly strong class and the standard of hay was higher than has been the case during the past few years. Weather conditions were fairly favourable when the crops were at their best and hence there was no undue delay in cutting by having to wait for the weather as there is in most years. The winning stack of Mr. R. Cassie's at Okato was a beautiful sample of clean well-saved hay, there being a splendid variety of grasses and clovers present.

In an endeavour to obtain a further alternative outside market the United States Government was again approached with a view to endeavouring to obtain admittance of New Zealand apples and pears into its country. Previous efforts had failed owing to the market conditions imposed in the United States against countries whose fruit was liable to be affected with the Mediterranean fruit-fly, this being extended to New Zealand (where this fly does not exist) on account of the fact that importations of fruit from other countries where the Mediterranean fruit-fly was present was permitted by New Zealand. After a period of negotiations an Order in Council was enacted prohibiting the importation into New Zealand of fruit from any country where the Mediterranean fruit-fly existed, and, as a result of this, the United States market was made available for us. Circumstances have prevented any large quantity being exported there during the present season, but as a result of the visit to Washington and New York of Mr. Campbell, Director of the Horticulture Division, it is anticipated that the United States market will be thoroughly tested out next season.—*Report, Director-General of Agriculture.*

SUCCESSFUL GRAZING OF PASTURES IN SHEEP-FARMING.*

THE DEVELOPMENT OF THE TITIPUA BLOCK.

W. E. HUNT, Invercargill, and A. STUART, Instructor in Agriculture, Invercargill.

AN area of 5,500 acres in extent, of which 1,500 acres is leasehold, known as the Titipua Block, was acquired by Sir William D. Hunt in 1928, at a nominal figure. This block is situated approximately five miles north-west of Dacre and is twenty miles by road from Invercargill. It is bounded on two sides by an afforestation area, as the land has been deemed unsuitable for agricultural or pastoral purposes. The district is undulating or rolling country, for the most part ploughable, with red tussock dominant. Areas which had been cultivated and grassed by the original settlers had rapidly reverted to stunted brown-top, and these settlers in many cases had been forced to quit their holdings after losing their investments. From this it may be deduced that the area may be rated definitely third class, and the carrying-capacity placed in the vicinity of one sheep to every 2 acres.

For the past five years an average of 300 acres per annum of this block has been sown to grass, and to-day some 1,500 acres are carrying fine swards of perennial rye-grass and white clover. The method of management is described briefly in the following statement :—

The land is ploughed in the spring and a crop of swedes or turnips taken, 1 ton of carbonate of lime being applied previously to sowing, and the crop sown with 4 cwt. per acre of a proprietary turnip-manure. The swede crop is fed off in breaks by sheep having a run-off on to pasture (ewes being fed for a month and hoggets for two months) ; the yields average between 40 to 50 tons per acre. In the following spring grass is established with a nurse crop of oats, and at establishment 3 cwt. per acre of superphosphate is applied. Following the harvesting of the oat crop a second ton per acre of carbonate of lime is applied in February. The subsequent manurial treatment has consisted of the application of $2\frac{1}{2}$ cwt. per acre of superphosphate in January to February. Up to the time of writing no further lime has been applied, and on the older pastures, which are now approaching six years of age, there is as yet no apparent need of a further dressing.

In the grass mixture sown, only the finest seed available has been used, and in all cases preference has been given to certified seed. In the case of the white clover the opinion has been expressed by Departmental officers that this clover is up to certified standard. The composition of the mixture used is : Permanent pasture perennial rye-grass, 25 lb. ; Italian rye-grass, 10 lb. ; Timothy (New-Zealand grown), 3 lb. ; Mother cocksfoot (Akaroa), 5 lb. ; *Poa pratensis*, 1 lb. ; *Poa trivialis*, $\frac{1}{4}$ lb. ; yarrow, 1 oz. ; permanent pasture Montgomery red clover, 1 lb. ; white clover (Hawke's Bay), 3 lb. : total, 48 lb. 3 oz. The seeding of oats is $2\frac{1}{2}$ to 3 bushels per acre.

For experimental purposes paddocks have been sown without nurse crops, and that the establishment in these paddocks is not

* Paper presented at 1934 Conference of the New Zealand Grassland Association.

superior to others sown at the same period with a nurse crop is the opinion of leading agrostologists who have visited and compared these fields. This is remarkable when it is considered that yields of up to 60 bushels of oats have been obtained. In passing, it is conceded that good establishment has followed from early autumn sowing.

An intensive form of controlled grazing has been systematically followed, and at no period of the year has the grass been allowed to grow beyond that stage when sheep could deal successfully with it—actually growth is never more than 1 in. in length. In this connection it has to be pointed out that surplus stock is available from the remainder of the block as yet unbroken, and consequently no provision has been necessary to conserve growth in the form of hay or ensilage. When the whole block is brought in, this problem will then arise. At this stage the effect of consolidation and heavy surface manuring effected by the intensive stocking must be taken into consideration as important factors in the maintenance of a highly productive sward.

In Southland the great majority of sheep-farmers practice "set" stocking from lambing-time until weaning, and, in the case of the more progressive, one cattle beast to each twenty ewes is included in order to give the sheep points of re-entry into patches of growth which get beyond sheep control from November onwards. These farmers, while recognizing that sheep prefer day-old grass, object to the extra labour which would be involved in the shifting of stock from paddock to paddock. From carrying-capacity figures available, these farmers winter the equivalent of five to seven sheep per acre and fatten three to five lambs per acre, of which approximately 70 per cent. are obtained fat directly off the mothers.

The above figures refer to straight-out fat-lamb production farms on medium to good country, varying in size from 400 to 800 acres; but on the Titipua Block the ewe lambs are retained to build up the flock, which is of the Romney breed. However, for comparative purposes, figures have been worked out for 790 acres of the older-established pasture, and the carrying-capacity is equivalent to 7·7 sheep per acre, allowing that five sheep are equal to each cattle beast employed. Specific particulars are that 3,331 ewes produced 3,592 lambs, which may be considered very good, as a big percentage of the flock were young ewes. Of the wether lambs 62 per cent. were fattened off the mothers by the end of February. From November to March three cattle beasts to every 4 acres were added to control the growth and prevent seeding of the rye-grass.

That the production of rye-grass culm is prevented by this method there is absolutely no doubt, but it is a moot point as to what extent the number of cattle could be reduced and sheep correspondingly increased and yet obtain the same pasture control. With the younger pastures stocking is reduced by approximately 40 per cent. until the second year, in order to allow the maximum of tillering to take place.

In conclusion, the following points deserve to be emphasized in this transformation of third-class into first-class land: (1) The heavy lime applications before and after the establishment of the pasture; (2) the use of certified strains of seed; (3) efficient grazing control; and (4) annual phosphatic top-dressing.

PIG IMPROVEMENT CLUBS.

A MOVEMENT which is getting a footing, and which promises to be distinctly valuable and economical to those participating in it, is the operation of pig-improvement clubs. Briefly, the objective of these clubs may be stated to be the introduction to the farms of members of good purebred pigs at the lowest possible cost.

The recently inaugurated Shannon Pig Club, which was founded on information obtained chiefly from Taranaki, illustrates the general nature of the activities of the clubs under consideration.

The Shannon Pig Club is limited to ten members, who elect a president, secretary, and treasurer. It is believed that a larger membership would be a disadvantage. The membership fee is £3 10s. The club intends to purchase periodically a purebred sow and litter which will be in the care of a selected custodian. The custodian provides skim-milk and a suitable site for a sty and yards which are erected by the club, and he receives 15s. for each weaner. No pig is carried beyond two months, except by special arrangement with the custodian. The weaners are disposed of, by ballot, to members at £1 10s. each. A selection committee of three is responsible for sale and purchase of stock, for selection of stock for breeding, for tattooing, and for weighing stock when three and eight weeks old. Cost of any service and cost to and from place of service is borne by the club. All membership fees are payable not later than the 31st October. No unfinancial member is entitled to any of the advantages of the club. All pigs not deemed fit for breeding purposes become the property of the custodian, who undertakes that these pigs are slaughtered and who purchases them at a price decided jointly by the club and the custodian. All pigs are supplied cash on delivery to members. A member leaving the district or giving up farming may continue as a member. Members deciding to sell their interest must sell to the club at the original subscription, payable when funds of the club allow. The majority vote of members shall be final in deciding any dispute. Any members who resign relinquish claims on the club. The above rules are given for the guidance of any other farmers taking part in the formation of further clubs.

Sterility.—Inquiry in regard to sterility goes to show that in all probability several factors are involved, falling under the headings of (1) mineral deficiency, (2) partially infertile bulls, (3) infection. Under the first heading fall those instances dependent on insufficiency of minerals in the feed, or their presence in a ratio unsuitable to the maintenance of the animal's requirements.

Reference must again be made to the necessity of better winter feeding of our herds. The nutritional aspect at this particular time must not be lost sight of, and the aim of every dairy-farmer should be improved conditions of feeding and also of shelter for his cows during the winter months.

Investigational work has shown the bull to be responsible in many instances for the occurrence of this trouble in a herd. Certain infections of the cow's genital organs are also involved.

Referring to this condition, the District Superintendent, Dunedin, who has conducted some keen observations regarding the trouble, states in his report: "There is every possibility of some dietetic factor having an influence in the production of functional sterility."

—*Report, Director, Live-stock Division.*

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 1st November to 29th November, 1934, include the following of agricultural interest:—

No. 70663: Cow-tail holder; W. Hansen. No. 70759: Flax-treating; H. Armitage. No. 71135: Yoking horses in tandem; R. C. Blackett. No. 71806: Cream-separator; E. S. Rogers. No. 71869: Moisture-vent for churn; Andersons Ltd. No. 71902: Curd-cutter; L. O. Bensemann. No. 71977: Hinge; M. Ferrick. No. 72587: Flame-thrower; R. H. Chisholm and R. E. Smith. No. 72673: Coating for cured meat; J. C. Hutton Pty., Ltd. No. 72674: Milk-manufacture; A. Axelrod. No. 72728: Chicken-incubator; S. B. Gamble. No. 72750: Hay-stacker; D. S. Riddell. No. 72781: Cattle-salt holder; P. A. McHardy. No. 70778: Fungicidal bodies; Imperial Chemical Industries, Ltd.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Commissioner of Patents, Wellington, price 1s. prepaid.

From information which has been compiled by the Census and Statistics Office from returns obtained from woolbrokers, woollen-mills, freezing-works, wool-scouring works, shipping companies, &c., it has been computed that the quantity of wool held in New Zealand on the 30th June, 1934, represented approximately 49,800,000 lb. in the grease, as compared with 78,600,000 lb. at the 30th June, 1933, and that the stocks are now lower than at the corresponding date in any of the four seasons immediately preceding.

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ESTIMATES OF THE SEASON'S LAMBING.

FOLLOWING are estimates of the current season's lambing in New Zealand computed from estimated average percentages furnished by Inspectors of Stock. Corresponding figures for the five previous years, together with the actual number of lambs tailed therein, are also given for comparison.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
		NORTH ISLAND.		
1934 ..	9,524,065	88·70	8,447,643	..
1933 ..	9,318,941	91·23	8,502,050	8,385,569
1932 ..	9,170,996	89·16	8,177,657	7,988,569
1931 ..	9,247,005	86·49	7,998,247	7,813,887
1930 ..	9,312,461	83·19	7,747,274	7,710,370
1929 ..	8,820,536	87·56	7,723,523	7,817,177
		SOUTH ISLAND.		
1934 ..	8,047,361	89·88	7,232,750	..
1933 ..	7,890,756	88·14	6,955,252	6,889,128
1932 ..	7,892,064	88·42	6,978,494	7,027,059
1931 ..	8,361,724	87·13	7,285,914	7,161,104
1930 ..	8,251,714	84·43	6,967,041	6,817,939
1929 ..	7,787,619	89·87	6,998,691	7,070,422
		DOMINION.		
1934 ..	17,571,426	89·24	15,680,393	..
1933 ..	17,209,697	89·82	15,457,302	15,274,697
1932 ..	17,063,060	88·82	15,156,151	15,015,628
1931 ..	17,608,729	86·79	15,284,161	14,974,991
1930 ..	17,564,175	83·77	14,714,315	14,528,309
1929 ..	16,608,155	88·65	14,722,214	14,887,599

District Estimates.

The following table gives estimates of the current (1934) season's lambing for the several sheep districts :—

Sheep District.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.
Auckland	1,877,835	88·69	1,665,390
Hawke's Bay - Gisborne ..	3,936,913	84·42	3,323,537
Wellington - West Coast ..	3,709,317	93·24	3,458,716
Marlborough-Nelson-Westland	758,536	78·70	596,948
Canterbury-Kaikoura ..	3,480,236	89·69	3,121,461
Otago (including Southland)	3,808,589	92·27	3,514,341
Dominion	17,571,426	89·24	15,680,393

—*Live-stock Division.*

Recently at Bushy Park Estate there was a most striking example of the beneficial effect of a legume crop on the succeeding crop. One-half of a field contained peas last year, the other half kale, which was fed off. Oats were sown this spring. Where the peas were, the crop is a beautiful dark green with a most luxuriant growth, whereas the remainder of the crop where the kale was is just normal.

SEASONAL NOTES.

THE FARM.

Preparation for New Pastures.

PASTURES which are intended to have such a long life that they are termed "permanent" are our most important crop. Advances in our knowledge about pasture strains and about top-dressing enable a greater length of life to be more readily and certainly associated with continuous high production than was previously possible. Any initial weakness is likely to affect production detrimentally throughout the whole life of the pasture. Because of these three facts, the task of establishing permanent pastures is one of the most important in New Zealand farming, and one which warrants much greater attention than at times it receives.

Poor results in the establishment of permanent pastures are generally due to one or more of the following causes: (1) sowing on poorly tilled land; (2) use of unsuitable seed; (3) sowing at an unsuitable time. In the case of pastures sown in the fall, sowing on poorly tilled land and sowing at an unsuitable time both usually may be traced to starting preparatory cultivation at too late a date. For full success the seed-bed for permanent pastures needs to be in a fine, mellow, and firm rather than in a loose lumpy condition. To secure the desirable condition, the cultivation of land to be sown in permanent pasture in the fall should now be kept in view. Hurried tillage eliminates the natural weathering of the soil, which has been shown by experience to be of much value in the economical production of a fine, firm seed-bed. The special need that exists for a fine, firm seed-bed arises partly from the really minute size of the vital parts of seeds of some of the more important pasture plants. There are about a quarter of a million rye-grass seeds and three-quarters of a million white clover seeds to the pound, and as a substantial portion of the pound is represented by seed-coats, it may be deduced that the vital parts in each seed are so minute that any process of covering them on uneven, lumpy ground must necessarily bury many of them so deeply that they are quite unable to send their shoots up into the light. The firmness of seed-bed that comes with fineness, apart from favouring even covering of the seeds, seems to beget vigorous root development. Even on the heavier soils that naturally consolidate relatively readily, failures which farmers at times are inclined to attribute to their being supplied with faulty seed are found, on inspection, to be due to a loose condition of the seed-bed—a good "strike" may be noted where there has been additional consolidation—*e.g.*, in hoof-marks or in wheel-tracks or at headlands, while similar seed has failed on the major and looser portion of the field.

If pasture is to follow an arable crop, it is often sound practice, provided the land is reasonably clean, to disk rather than to plough—the greater firmness of seed-bed given by the disking may be an advantage, and additional fertilizer, provided by the animal manure, is retained near the surface, where it most readily benefits the young pasture plants.

As the seed used is of basic importance, it is unfortunate that three weaknesses in respect of seed mixtures are of common occurrence. Firstly, at times, the amounts of different pasture plants included in the mixture are not in accord with those suggested as suitable by field experience; sometimes money is spent on seeds of plants which are not worthy of a place in a mixture; and sometimes seeds of plants which are of considerable value in specific circumstances are omitted in such circumstances. Secondly, suitable amounts and kinds or species of seeds may be used, but strain

differences within a species may be ignored, with consequent marked inferiority in the resultant pasture. The great benefit of employing a good strain of perennial rye-grass is now widely recognized, but it does not seem to be so widely understood that analogous benefit is to be secured from the use of superior strains of clover and of cocksfoot. The only sure way of exploiting recent advances in our knowledge relative to strain differences within pasture species is to use certified seed. Thirdly, the use of suitable species and strains of seeds in appropriate amounts is not sufficient to ensure a satisfactory seed position unless care has been taken to obtain seed of good germination capacity, vitality, and purity. The report of the Seed Analyst which appears on another page provides interesting information about variations relative to germination and purity which were noted last year when there were no marked departures from the normal average position. The report contains abundant evidence that within the one district in the one season there were, as usual, substantial variations in germination capacity which indicates that price comparisons alone were very imperfect guides in the purchasing of seeds. The report also contains evidence that lack of caution in purchasing seeds would at times lead to the inclusion in the seed mixture of seeds of such plants as Californian thistle, ragwort and ox-eye daisy—*e.g.*, a normal sowing of cocksfoot and dogstail in a mixture for an acre might have included 4,480 seeds of Californian thistle. Many of the faults commonly characterizing pasture seed-mixtures may be avoided by seeking advice from district officers of the Fields Division. As time may be required for proper attention to some of the matters calling for consideration, the purchasing of seed for permanent pastures should not be made in the hurried manner which is necessary when the selection of seeds is deferred until just before the seed is to be sown. Hasty purchase of seed is likely to be haphazard, and not based on as full a knowledge as is desirable in respect to such important matters as the strain and germination of the various lines of seed available.

The date of sowing of pastures in the autumn fairly frequently is too late. In many parts an element of danger attaches to any sowings later than March—occasionally, of course, sowings which would be too late in the majority of a series of seasons are quite successful, and because of this such late sowings are carried out generally and the number of relatively poor results that necessarily ensue are attributed to anything but the real cause, which is the bad management that is involved in risking the dangers attaching to late sowings. It is widely known that clovers are likely to suffer in late sowings, but it seems not to be so generally known, although it has been well demonstrated, that the development of rye-grass and other plants in late sowings is at times subject to great checks from which it is doubtful whether the sowing ever fully recovers.

General Pasture Work.

Unless recently top-dressed fairly liberally, pastures from which hay or silage has been saved may be expected to react profitably to a dressing of superphosphate applied as soon as the mown material has been removed. Such top-dressing is likely to be useful irrespective of the stage of growth at which the pastures were mown, but pastures mown in a leafy stage have more vigorous aftermaths than similar ones mown at a later, somewhat stemmy, stage. The former usually give the greatest direct return from top-dressing as suggested, but pastures mown at an overmature stage are frequently weakened, and so are in especial need of the strengthening provided by the top-dressing.

Not generally, but occasionally, it proves advantageous to allow thinned deteriorated pastures to run to seed in summer, provided such pastures contain satisfactory numbers of useful plants which it would be beneficial to increase in number by reseeding. If such reseeding takes place, the

pasture should be well harrowed in the autumn when the seed has ripened and when rain sufficient to allow of safe establishment of seedlings may be expected. Under favourable circumstances such management may usefully lead to thickening of swards, especially when ploughing of an open weak turf is either not possible or not desirable. However, it is advisable to keep in mind that if the desirable species which it is sought to increase have declined because of unduly low fertility, then reseeding will fail to bring about a permanent increase in their numbers unless the fertility is suitably increased by appropriate top-dressing or by other effective measures. Further, as a means of obtaining improved swards, repairing of weakened swards by reseeding is frequently an inferior alternative to ploughing and eventual regrassing.

Apart from areas for special seed-production, generally precautions should be taken to obviate the production of seed by recently sown pastures during their first year, and such precautions are particularly advisable if the young pastures are permanent ones containing slowly developing as well as quickly developing species. Seed-production by young pastures of this type is likely to lead to harm of the valuable, more slowly developing species. When young pastures cannot be controlled adequately by the stock available, topping with a mower should be employed.

Utilization of Summer Feed.

At times the best possible returns from special feed grown to supplement the pastures in summer are not obtained because a commencement with the use of the feed is not made early enough. In dairying, such special feed should be used not in remedying the position after an avoidable drop in production has taken place, but in preventing the occurrence of such a drop. Over wide important dairying areas this means that the use of special feed should be commenced shortly after Christmas, and this notwithstanding the fact that in such districts many consider it unnecessary to do any special feeding of producing dairy stock until about February.

Because of the prevalence of stemmy feed in summer it is well to remember that such feed is far from ideal for young developing stock. Actually growing stock such as calves develop well only when they receive highly digestible feed relatively rich in the materials required for the formation of muscle and bone—materials in which stemmy feed is dangerously poor and in which leafy feed is relatively rich.

In carting out special feed such as soft turnips, it is generally advisable to scatter it well over the field in order that no portions become injuriously fouled with droppings, but if the fertility of a particular area requires building up, then it may be advisable to concentrate the feeding out on that area, which should be harrowed fairly frequently when suitable opportunity arises.

General Cropping Work.

If the sowing of turnips and swedes has not been completed by the end of December, as a rule, it should receive attention as speedily as possible. When rainfall is good, sowing may continue into January, but in most places after the middle of January it is much safer to sow turnips than swedes—turnips not only develop more quickly than swedes, but also suffer less from insect pests which at times, especially in dry seasons, appear in summer and autumn. Hardy Green Globe turnips are suitable for January sowing.

If the weather allows of the desirable preparatory cultivation, it is at times useful when additional winter feed is desired to sow in the late summer or early autumn, on land not yet broken out of grass, a temporary pasture mixture consisting of 25 lb. to 30 lb. of Italian rye-grass and 4 lb.

to 6 lb. of red clover an acre. If the temporary pasture is likely to occupy the land for less than a year and quick production of feed is especially desired, then half of the Italian rye-grass may usefully be replaced by an equal amount of seed of Western Wolths rye-grass.

When the land available for late summer or autumn sowing will be required in the spring for another crop it may prove well worth while to grow a cereal catch crop such as oats or black skinless barley—both of which are usually sown at the rate of about 2½ bushels of seed an acre. Such cereal catch crops, under favourable conditions, yield considerable winter and early spring feed, and in the spring may be followed by roots or other suitable crops.

Often the fullest possible returns are not obtained from temporary pastures or cereals sown for winter feed because the crops are sown too late—this applies especially to the South Island. With such crops a dressing of 1 cwt. to 3 cwt. an acre of superphosphate is usually quite profitable. The likelihood of success with the crops mentioned above is lessened if there has not been thorough preparatory cultivation.

Often, if necessary, lucerne may be sown with success in January, but on the basis of experience sowing in November and December is generally preferred. Lucerne-seed is relatively small, and, because of this, it should not be sown at a depth greater than 1 in. If there is likely to be sufficient soil-moisture to allow of superphosphate exerting its fertilizing influence, then it is often good practice to top-dress established lucerne with superphosphate after it has been mown, about midsummer.

Ordinarily potatoes profitably repay considerable attention at this season. In addition to being kept free from weeds by suitable cultivation, they usually will need to be moulded up and possibly to be sprayed for late or Irish blight. It is particularly desirable to utilize such spraying as a preventive rather than as a remedial practice. As a rule, cheaper and more effective spraying results from the use of sprays prepared on the farm instead of purchased ready-made preparations. Full particulars about spraying may be obtained from district officers of the Fields Division —it is important to bear in mind that incorrect procedure in any particular may lead either to damage to the crop or to failure to control the blight.

Summer Tillage and Moisture of Soil.

In a figurative way, which is nevertheless well justified by the facts, gardeners sometimes refer to cultivation of the surface soil during dry weather as "hosing with the hoe." Underlying this expression is the fact that the maintenance of a loose layer of soil at the surface is of particular value under dry conditions as a means of preventing loss of soil-moisture by evaporation from the surface. Since antiquity this fact has been applied in successful systems of dry land agriculture in which moisture is saved by a most thorough system of tillage which maintains the loose condition of the surface layer, known as a soil mulch. The full practical significance of the influence of suitable tillage on supplies of soil-moisture can be gauged only when it is remembered that in many districts, and especially in the drier ones, a most common cause of unnecessarily low yields in crops is inadequate moisture in the soil. Further, cultivation begets soil-aeration, which leads to some changes that increase fertility. Because of all this, summer tillage usually proves particularly profitable in the growing of such crops as mangels, potatoes, carrots, and swedes in rows wide enough apart to allow of intertillage.

—R. P. Connell, Fields Division, Palmerston North.

THE ORCHARD.

Control of Pests and Diseases.

THE continuation of spraying, as previously advised, will be necessary until at least the end of January, and in many instances a further one or two applications may be necessary for the control of the various fungous diseases and insect pests in pome fruits.

Good control of red-mite is extremely important if the fruit is to be kept free from mite eggs and the tree healthy. If the foliage is allowed to become bronze in colour, due to mite infection—as unfortunately occurs only too frequently—it is logical to conclude that the foliage cannot function as it should, and that as a result many of the blossom-buds being formed will prove to be too weak to set fruit in the following season. The control of red mite is readily effected by two applications of summer oil at a dilution of 1 to 2 per cent. The time of application depends largely on the severity of the infection and the need for sulphur sprays. In most instances it is best to make the first application early in February and the second ten days later. About fourteen days should be allowed to elapse before applying an oil spray following a sulphur spray. If the foliage is in poor condition, this period should be extended.

There is evidence which indicates that the addition of nicotine sulphate, at a dilution of 1–1,000, to summer oil sprays effects a considerable improvement in the control of mealy-bug. Consequently where this pest is in evidence, or has been troublesome during the previous season, this spray is recommended.

Botrytis-rot (eye-rot) injury in or near the calyx at times causes considerable loss, particularly in certain varieties. Investigations into the cause of this trouble indicate that the initial injury is due to soluble arsenic, and that the rot is a secondary result. The presence of soluble arsenic in spraying combinations can be avoided if the mixing of the various specifics is done in the correct manner. See notes below regarding the mixing of sprays.

Stone fruits should still receive attention by periodical applications of lime-sulphur 0·083 per cent., plus colloidal sulphur 2 lb., per 100 gallons for control of brown-rot, shot-hole, leaf-rust, &c. An application just prior to the earliest fruits reaching maturity is of the utmost importance in the control of brown-rot. Summer oil 1 per cent., or nicotine sulphate 4 per cent. (1–800), can be applied where necessary for the control of green or black aphis. Leech (pear-slug) can be readily kept in control on plum or pear trees by spraying with lead arsenate 1½ lb. plus hydrated lime 3 lb., per 100 gallons water, whenever the pest becomes troublesome. Leaf-roller caterpillar on apricots, peaches, or nectarines can be kept in control by spraying with 1 per cent. summer oil—these trees will not tolerate arsenate.

Mixing Sprays.

By mixing certain spray combinations in the wrong way not only may the fruit and tree be injured, but the effectiveness of the spray may be reduced in no small measure. Inefficiency in this way is most common when lead arsenate is combined with lime-sulphur. A faulty mixing of these two specifics is usually indicated by the mixture turning a muddy black or muddy green colour, instead of remaining the same colour as when lime sulphur is used alone. This discoloration indicates that a chemical reaction has taken place, leading to the liberation of a soluble arsenic compound, which is liable to cause spray injury and impair the efficiency of the mixture as fungicide.

The method of mixing recommended is to add the required quantity of lime-sulphur to the spray-tank as it is being filled with water. Mix the lead arsenate with a small quantity of water in a separate vessel, using

sufficient water to make a thin liquid. Hydrated lime must also be added to the mixture, and this should be creamed before adding to the lead arsenate. When the spray-tank is almost full, add the arsenate-lime solution slowly to the lime-sulphur solution with the agitator working. Regarding the quantity of lime to use, this will depend on the quality of the lime. For a good-quality hydrated lime—*i.e.*, one with a high calcium hydroxide content and a small percentage of large particles—use two to three times as much lime as lead arsenate.

Cover Crops.

The growing of cover crops in established orchards has been proved of considerable value in maintaining the general vigour of the trees, particularly on land that is naturally deficient in humus. Leguminous crops are recommended for this purpose on account of their value in adding nitrogen to the soil. Blue lupin is extensively sown for this purpose and is suitable for most districts. Other legumes suitable for cover crops in orchards are tares, partridge peas, and white lupin. (In a small trial with tares carried out on clay loam soil in the Motueka district during the past season the variety *V. Narboresis*, Moscow, proved superior as a cover crop to nine other varieties of tares used in the same trial.)

The time for sowing cover crops must vary according to the local conditions. In the colder districts where a long winter with severe frost is likely to check growth it is desirable to sow early in January. In the warmer districts where growth will continue during the winter months sowing in the latter part of February or early March is recommended. The use of 2 bushels of lupin-seed per acre is advised for cover crops.

Handling Stone-fruit Crop.

All stone fruit is extremely perishable, and so requires most careful handling. Picking bags are generally unsuitable for use in harvesting this class of fruit, owing to the risk of the fruit being bruised, and, as a result, developing brown-rot before it reaches the consumer. A very few decaying fruits in a case of otherwise sound fruit might readily reduce the market value of the whole case out of all proportion to the number of fruits affected. Consequently every possible precaution should be taken to ensure the fruit reaching its destination in a sound condition.

Budding.

Budding is a quick and effective method of changing a tree to another variety. While used principally on stone-fruit trees, it is also equally successful on pome-fruit trees. On trees where grafts of the present season have failed, shoots arising from the stock can be budded, and so take the place of the dead graft. Buds for this purpose should be taken from the current season's growth and inserted into growth of the same age.

The time to bud is influenced by the state of preparedness of the stock. The tree or the shoot of the tree to be budded should still be making growth when the operation is performed, otherwise there will be no flow of sap to form the union. If budding is done too early in the season the sap will flow through the wound excessively and often result in the death of the bud. As a general guide, cherries can be budded in December, apricots in January, plums, apples, and pears in February, and peaches and nectarines in late February or March.

Buds should be selected from a shoot that is still making growth. It is advisable to take the buds from near the centre of a shoot, which buds are usually more suitable than those near the base or near the extremity of the shoot.

—P. Everett, Orchard Instructor, Gisborne.

Citrus Notes.

As indicated in last month's notes, cultivation should be attended to in order to conserve the moisture during periods of dry weather—land which is inclined to be lumpy can be reduced easily to a fine condition after a light shower. At this period of the year heavy demands are made upon the trees after producing a heavy crop of blossoms. If cultivation cannot be done, the trees should be mulched with some well decayed animal manure or old stack bottoms, taking care not to place any animal manure close up to the trunk, as it may become injurious.

As much of the fertilizers applied earlier in the season will now have been used up, the trees would benefit by receiving an additional dressing of some nitrogenous manure such as sulphate of ammonia or nitrate of soda at the rate of about 2 lb. per tree for a full-sized tree and less quantities for smaller trees. The application should be made during periods of showery weather, and if worked into the soil the fertilizer would become immediately available.

Much useful work can be done if some of the young lateral growths are pinched back when they have made about 12 in. of new wood. This pinching will induce more side growths to develop, which later will develop into fruiting laterals. At times one is confronted with long bare laterals with only a few fruits on the end, and this can be avoided if the ends are pinched out as indicated. If there be produced in the centre of the tree strong sappy young growths which might develop into strong useless branches they should be taken right out in the early stages, thereby obviating the cutting-out of large limbs later on.

A sharp lookout should be kept for thrips, and where they are troublesome the trees should be sprayed with either nicotine sulphate 1–800 plus 3 lb. of soap per 100 gallons or one of the summer oils at a 2-per-cent. dilution. As thrips attack mainly the under-side of the leaves, very careful spraying is necessary in order to reach them. However, where careful spraying is carried out no trouble should be experienced in keeping them under control.

A scale (*Ceroplastes rusci*), which was first recorded two years ago, appears to be spreading, and growers would be well advised to keep a sharp lookout for it. This scale somewhat resembles a small star in appearance, and as it may become troublesome if not kept in check growers should spray for its control as for other scale insects until such time as some definite means of control has been found. The usual summer oil may be used at the following strength: 2 oil, 98 water. The application should be thorough, and two or three subsequent sprays may be necessary at about twelve-day intervals in order to become effective.

—L. Paynter, Orchard Instructor, Auckland.

POULTRY-KEEPING.

Current Topics.

With the hatching operations completed for another year and little culling having yet been carried out, together with the rapid development of the young stock, the accommodation available on the majority of plants will be taxed to the utmost, with the consequent risk of the quarters becoming overcrowded with its attendant evil effects, and the necessity for culling out every bird that is not likely to show a profit over its keep is therefore apparent. This implies the weeding-out of all surplus cockerels that have attained a marketable age—*i.e.*, about five months old. In addition, it will pay to dispose of all old stud males at once. It is seldom that the male bird can be depended upon for breeding purposes after the third

season, and the keeping of such stock means a continual drain on profits. Even young males which are showing signs of an impaired constitution, and which do not promise to be serviceable for future breeding purposes, should also be got rid of. It should be remembered that strong constitutional vigour is the basis of resistance to disease and heavy producing stock, and that no bird which is lacking in this respect should be retained on the plant for breeding purposes. There is considerable advantage in having all unprofitable stock out of the way. Not only are the evils resulting from overcrowding minimized, but there is a saving in the present costly foods, while, in addition, the clearing-out of unnecessary birds allows more space for the young pullets, to say nothing of the saving in labour and attention.

Heavy Mortality among Artificially Reared Chickens.

It is safe to say that thousands of chickens being artificially reared have been lost this season, due to a trouble induced by overcrowding and insufficient ventilation. The effect of the sweated condition is manifested in several ways, the chief of which is an inflammation of the veins, the visible signs of which are swellings in the joints, with a gangrenous condition supervening. The swellings and discoloration first make their appearance in the hock joint, and then travel to the wing. In a few days the neck and head swell and then death is not far off. In such cases, which arise solely from improper management, nothing can be done for the chickens badly affected. Those in the early stages may be saved and the trouble prevented from spreading to the healthy chicks by providing the proper night conditions. There is no cure for this trouble, but it is not infectious, and it is merely a question of prevention. Above all, one should not overcrowd, but should provide ample ventilation, keep the quarters clean and dry, and avoid everything that tends to create a moist atmosphere. As a further means of preventing trouble from sweating, the chickens should be encouraged to perch at an early age, for once they have acquired this habit the trouble is seldom, if ever, experienced, provided that special care is taken to see that the young birds are not overcrowded. This trouble not only affects chickens during the brooder stage, but also after they have been transferred to the colony house. In many cases of complaints received recently regarding mortality in chickens from this trouble, the owners generally regard it as some new mysterious form of disease over which they have no control. The writer has been familiar with it for well over a quarter of a century, and invariably the cause could be traced to subjecting the chickens to improper night conditions and most particularly to the practice of overcrowding. The overcrowding means huddling, and consequently this leads to the birds getting in a sweated condition, which is undoubtedly the sole cause of the trouble. It is true that the most experienced men in the business of poultry-keeping have much to learn in regard to artificial rearing, and it is only to be expected that the layman, or even the person with some experience but who does not possess a special aptitude in the work of brooder management, will fail to rear chickens always with success. In the case of some of the plants investigated the mortality was put down to various causes, such as a weak constitution possessed by the young birds purchased as day-old chicks, the commercial chick food being fed, and also to the style of brooder being worked, but it is clear that improper management was solely responsible. In the work of artificial chicken-rearing, the point should never be lost sight of that the best brooder ever manufactured, or the best set of instructions ever framed, will fail to spell success if the person in charge of the rearing operations is incapable of thinking out things for himself and applying the knowledge of the necessary work which is now available. There are so many things responsible for successful rearing by artificial means that it is necessary to look for the cause in many quarters. For example, in the Department's Bulletin No. 66, "Utility Poultry-keeping," an illustration is given of a frame and particulars thereof which was devised

at the Wallaceville Poultry Station to eliminate sweating with brooder chicks, and which consequently has had a highly desirable effect in preventing the trouble referred to, and which is commonly known to experienced poultrymen as "green-leg" or "green-wing," for the reason that when the trouble is present these parts generally become affected as well as the head and throat; but even where such a frame is used the trouble may make its appearance at any time if the essential precaution is not taken to prevent overcrowding. This implies that the smaller the number of chickens placed together during the brooder stage, or after they have been transferred to the colony house, the less risk there will be of their becoming affected with this dread trouble. It is safe to say that overcrowding is one of the most common mistakes made in the rearing of brooder chicks to-day. One should never be tempted to put in just a few more, but work only with numbers that can be handled with absolute confidence.

It frequently happens that from four to five hundred chickens are placed under a canopy brooder or in a colony house having a capacity for only half this number. The writer has been tempted on several occasions of late to advise owners whom he has visited to put a sign over every doorway and gateway on the plant, "Don't overcrowd," as it is well known by successful poultrymen that, whether it be with growing or adult stock, the smaller the number of birds placed together, in reason of course, the greater will be the success achieved. Overcrowding in itself is bad enough, but when combined with dirty quarters it is not to be wondered at that heavy mortality takes place under such conditions. It is surprising how some breeders will go on year after year losing their chickens in large numbers, and contenting themselves with the idea that some mysterious disease over which they have no control is responsible. The blame is usually attributed to bad luck, but there is no bad luck about it. In practically all the brooder troubles investigated the disease is not found in an epidemic form. All the troubles have been the result of mismanagement in the rearing of the chickens, faulty incubation, or to weak or improperly managed parent stock. It may be mentioned that previous to the advent of the popular canopy style of brooders, green-leg in chickens was seldom met with during the brooder stage, probably because, with the old style of heated brooders used, one hundred chicks was generally regarded as the maximum number that could be placed together in a brooder if the young birds were to be successfully reared. Now, however, it is not uncommon to see several hundred chicks being placed under a canopy type of brooder, so that, unless the young birds are subjected to nothing but sound management, particularly during a hot muggy season as has been experienced of late, green-leg and other troubles caused by the young birds becoming in a sweated condition is openly invited. Over a long period of years, however, the trouble was frequently met with in chickens after being removed from the heated brooders to a colony house, and particularly where they were subjected to overcrowding, damp, ill-ventilated quarters, and were not encouraged to perch at an early age.

Thin-shelled Eggs.

The production of thin-shelled eggs is a common occurrence at this period of the year, when the great majority of the birds are giving a maximum egg-yield. The trouble is usually due to insufficient shell-forming material being supplied, or to the birds being overprovided with rich foods, such as milk, meat, meat-meal, &c. As a preventive, an amply supply of broken oyster or other sea-shell should be available to the birds at all times. If this does not bring about the desired improvement, the only safe course is to feed less of the forcing ration.

As to the method of supplying broken shell, or indeed grit of any kind, some people make the mistake of providing these materials in a narrow receptacle into which the birds can merely put their heads. A much better plan is to place the material in a wide box, or even on the ground, so that

the birds are given an opportunity of scratching it about and picking out the pieces they like best. Especially is this necessary when both gravel-grit and sea-shell are mixed together. It must be remembered that the laying bird will consume more than double the amount of shell in proportion to stone grit. Thus it will be seen readily that owing to the latter being in the way and the birds being unable to scratch over the material themselves, they may easily be prevented from securing the necessary egg-shell-forming material so much required by them, especially during the heavy producing season.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

Control over Breeding.

One of the most important factors in the successful practice of modern apiculture is securing control over the breeding, and this can be obtained by compelling the bees to build whatever comb is desired.

Under natural conditions, or when in hives and allowed freedom to construct combs, bees invariably build a large proportion of drone-comb, which is subsequently utilized for breeding drones. Some drones are needed for the impregnation of young queens, and usually a sufficient number for the purpose will be bred even when the breeding of them is restricted by making the fullest use of worker comb-foundation. The comb-foundation obtained from manufacturers is impressed with the bases of worker-cells, and by the use of full sheets good worker-combs are usually obtained. However, accidents may happen to the combs; portions of the foundation may break away under the weight of a good swarm, and other portions sag and stretch, owing to the comb-foundation being carelessly fixed. In such circumstances the bees will quickly build drone-comb, and thus defeat the purposes for which the foundation was originally designed.

The replacement of such combs is a matter of urgency, otherwise countless drones will be raised and the toll on the stores gathered by the workers will result in the ultimate returns from the hive being considerably curtailed. The beginner will be loath to remove the combs containing drone-cells, on account of the presence of worker-brood. To reduce the number of drones being reared he will be tempted to bring into use drone-traps, which hamper the access of the worker-bees to the hives, or he may elect to destroy the cappings on the cells. Such measures are ill advised, and cannot be counted upon to remedy successfully the drone trouble. The most effective way to prevent the rearing of drones is to remove the combs containing the drone-cells. This may be accomplished by removing the combs from the centre of the brood-nest to the side of the hive, or by placing them in a super over an excluder. When the worker-brood has hatched the combs should be removed altogether.

After-swarms.

The beekeeper should give some little attention to the prevention of after-swarms. These swarms are a nuisance, and weaken the parent hive without being of much value in themselves. If the colonies are left undisturbed they will swarm freely, and all chance of a surplus is lost.

Among the many plans practised for their control the most successful is that which provides for removing the parent hive. This method is an excellent one, and will usually prevent the issue of the small swarms. As soon as the swarm is hived the parent hive should be removed to a new location in the apiary, and the swarm put on the old stand. The effect of this change is to strengthen the swarm with the field bees which are absent gathering nectar, and correspondingly to weaken temporarily the

old hive, so that it will rarely put out a second swarm. The emerging bees in the parent colony will soon provide sufficient workers to ensure a surplus, and the tendency to swarm will not be so prevalent. In order to make the operation more successful the parent colony should be examined for queen-cells, and they should be all removed except two.

After-swarms should always be returned to the parent colony unless they are required for increase. In the latter case it is a good plan to dump two or three swarms together, and thus form a strong colony that will gather sufficient stores to carry on through the winter. In dumping it is advisable to shake the swarms on to an excluder placed between the supers, so as to take out the young queens. Before returning an after-swarm, overhaul the parent hive and cut out all the queen-cells. Place two or three empty combs or frames fitted with sheets of foundation in the brood-chamber, and put the brood over an excluder to hatch out. In case the colony contains a virgin queen the combs, before being placed over the excluder, should be shaken in front of the hive to make sure that the virgin queen is not confined above the excluder, or she will not get mated, and a drone-raising colony will be the result. A good plan at all times is to provide an opening for the bees between the super and the brood-chamber, which can be done by inserting a small block of wood immediately under the edge of the super. This will allow the bees to fly freely, and in case the virgin queen is by accident confined to the super, an opportunity will be given her to fly and get mated. Likewise the drones can pass out of the super. If on making a later examination the queen is discovered in the super, she can be placed in the brood-chamber, under the excluder.

Foul-brood.

As advised last month, beekeepers should not fail to treat diseased colonies where found. This work should be carried out in advance of the main flow, so that undivided attention may be given to securing a crop. Over and over again the treatment of disease is delayed until such time as the season is advanced, and as a result the affected colonies do not count as producers in the main crop; whereas if treatment is carried out as soon as nectar is being secreted freely, these colonies will be in good heart to produce a surplus. When in doubt as to the presence of disease, it is advisable to forward a sample of the comb addressed to the Director of the Horticulture Division, Wellington, or to the district Apiary Instructor, for examination.

Queen-excluders.

The season is at hand when it is advantageous to use queen-excluders. During the height of brood-rearing, in order not to cramp the queen, she should be allowed the full use of the super, so that large numbers of worker-bees may be raised to work the main crop. It is not wise to bring the excluders into use too early, and it should never be done until the bees are working freely in the super. By cramping the queen fewer bees are produced, and small returns will be netted. Every encouragement must be given the queen to lay to her utmost, and by doing so populous colonies will be produced.

The best time to put the excluders on the hives is when the main flow sets in and the bees are busy bringing in nectar. Too many beekeepers make the mistake of putting on the excluders when the supers are first placed on the hives, and it is not an easy matter to get the bees to work in the supers even if combs of honey are raised from the brood-chamber, as excluders tend to make the passage between the lower story and the upper more difficult. Before placing the excluders, it is advisable to make a careful examination of the colony to note its condition, and to take stock of the number of frames of brood in the hive. If the brood-chamber is full of brood the combs may be manipulated so as to provide the queen with ample room for laying during the period which follows. The best

plan is to place the majority of frames of capped brood over the excluder, and to substitute empty combs, taking care to see that the queen is confined below. As the bees hatch out over the excluder, they will become accustomed to passing through it, and as fast as the cells become vacant they will be filled with honey. If eggs are raised with the brood care must be taken to see that the bees do not raise queen-cells, for in the latter case the hive may swarm out, leaving one or more virgins in the top story, and these queens, being confined to the hive, cannot get out to be mated, and will eventually develop into drone-layers. Within one week after raising the brood examine the combs in the super to note if any queen-cells have been raised. If any are found they must be destroyed.

The advantage of the use of queen-excluders is in saving labour at the time of extracting, by doing away with the work of picking over the combs. Much time is lost in this operation, and extracting is retarded when everything should be hurried. It is only by the use of excluders that bee-escapes can be employed, and in many seasons, depending largely on the weather, these have to be brought into use.

Treatment of Swarms : Provision of Supers.

There is a little doubt in the minds of many beekeepers who have been accustomed to box hives as to the surplus to be obtained from a swarm. It is not uncommon to find swarms put into frame hives and not provided with room for surplus. Unless supers are given to strong early swarms from ten to fifteen days after they are established, these colonies will often swarm again, and no surplus will be obtained. It must be understood that the season plays an important part in the returns netted, but large amounts are lost yearly through the beekeeper neglecting to give ample room for the swarm to store honey.

When a swarm has been established a few days, a quick examination should be made to note progress, and from this the beekeeper will be able to form some idea as to the time at which the super will be required. Nothing works so well as a swarm under proper treatment, and the attention given in providing supers will amply repay the beekeeper.

Queen-rearing.

In last month's notes attention was directed to queen-rearing. Every effort should be made to requeen the apiary during the working season, so that the colonies will go into winter quarters headed by a good queen. It often happens that the beekeeper is dissatisfied with his stock, in which case his best plan is to send direct to some reliable breeder and secure a number of good queens. Whether this suggestion is carried out or not, when raising queens the beekeeper should select the best stocks in his apiary ; in other words, queens should be raised from queens whose bees have a record as honey-producers.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

Vegetable Crops.

EARLY potato crops are now being lifted, and there is usually little danger of loss through the attack of the fungous disease known as late or Irish blight. In the case of main crops which do not ripen until late autumn there is considerable danger of loss from this cause in some districts, chiefly those which experience warm humid weather at this season of the year, or where infected seed has been planted. Where this danger exists the potato crop should be sprayed with bordeaux 3–5–50, when the tops are dry, with a view to preventing the spread of the disease, the application being

repeated, as necessary, at intervals of two or three weeks, so that new foliage may be covered, and the dressing renewed where it has been washed off by heavy rain. The successful use of this spray depends on proper mixing and a thorough application being made in the form of a fine mist. The 3 lb. of bluestone may be dissolved in hot water and added to 40 gallons of water. The 5 lb. hydrated lime is then mixed to a fine paste and diluted to the extent of about 5 gallons, and then *slowly* poured into the bluestone solution, thoroughly stirring it meanwhile. The mixture should be used at once, as considerable deterioration takes place if it is held over; so long as the solutions are kept separate, however, they will keep for a long period. For spraying potatoes, washing-soda may be used in the place of the hydrated lime; the spray material is then spoken of as Burgundy mixture. Another important precaution is to make the bluestone solution in a wooden vessel; if metal is used both the vessel and the solution are likely to suffer.

Onions and shallots planted out in early spring will soon commence to ripen; they are best lifted before the autumn rains commence, and in humid districts should be dried off under cover where good ventilation is available.

Where any of the following winter crops are to be grown they should be planted out not later than the month of January: savoy and red cabbage, kale, broccoli, cauliflower, leeks, and celery. It is to be remembered celery is a water plant, and should never be allowed to become dry. The protection of these crops from pests and disease has been dealt with in recent notes: they will require close attention for a few weeks.

Late crops that may be sown now are dwarf beans; peas, of an early variety; shorthorn carrots; globe beet; turnips; radish; spinach; silver beet; lettuce; and parsley. By sowing thinly, much of the labour of thinning the young plants will be avoided; the seeds also will probably "go" twice as far. Most samples of seeds of the above kinds of vegetables have a high percentage of germination.

Tomato Crops.

Towards the end of the month of January the harvest under glass will be drawing to a close and that of the outside crop just commencing. The valuable qualities of the tomato are becoming better known; a full-flavoured juice, without preservatives, is now on the market; it is an exceptionally refreshing drink, especially for people who have been working or playing hard. Also a paste is made which is appetizing and satisfying; it is an ideal filling for sandwiches. As a *purée*, sauce, or chutney, during the winter especially, this fruit is an old favourite. With so many popular uses very little of the fruit grown should be wasted; unfortunately, waste sometimes occurs. The modern system of shipping the goods on consignment to distant markets by a number of small individual consignors has the effect of making it difficult to maintain the steady supply on the market which is necessary for maximum consumption. This is a problem which requires the careful consideration of shippers at the present time.

In warm districts, especially where the crop is growing in a loam overlying a shingly subsoil, and the rainfall is irregular, an adequate supply of water in the soil can often be secured at this season of the year only by supplementing the natural supply. Artificial watering is done best where there is an ample supply of humus in the soil; such soils as that mentioned should receive every consideration in this regard.

Small Fruits.

Fruiting plants which carry the crop on the one-year-old wood only are very commonly pruned soon after the crop is harvested, the method usually being to cut out the wood that has borne down to a bud at its base. This has the effect of getting rid of most of the disease which

may be present on the plant, allowing the sun to ripen the young wood for next season's cropping, and facilitating the application of any sprays that may be necessary. Small fruits requiring this treatment are raspberries, loganberries, and black currants. The prunings should be carried out and burnt.

Whether the pruning is required or not, plantations of small fruits should be cleaned up as soon as the harvest is over and given treatment that will put them into good condition for another crop. Where well-rotted farm manure is scarce it is often an advantage to apply to the land a dressing of phosphates and sow it down in a cover crop for turning under later. Strawberry-beds which have reached the end of their usefulness should be worked up and planted with a winter crop, such as broccoli. Before doing this it is advisable to look over the old plants and make a selection of the most healthy of those which have a good cropping record: planted out in a piece of fresh ground they will make good stock plants from which to obtain runners for further planting. Where new plantations of small fruits are to be made, the ground will probably be available as soon as an early crop of vegetables is harvested: the ground should then be taken in hand, cleaned, and well stocked with humus in preparation for planting strawberries during the autumn or bush fruits during the winter. As these crops are comparatively permanent, the preparation should be good, especially as regards the eradication of bad perennial weeds.

The Homestead Garden.

The fine display of hydrangeas and roses at recent shows amply demonstrates the suitability of these plants for first-class results on many classes of soils. The plants mentioned also provide their generous harvest of blossom during summer and autumn, when most of our flowering shrubs are long past that stage. They are therefore of particular value in maintaining a good display in the latter portion of the procession in the floral carnival of the garden. We are under a great debt of gratitude to the hybridizers who are producing hydrangeas in such a variety of form and colour that was quite unknown but a short time ago. The output of the rose specialists has much improved; new varieties which have only sensational colours, possibly only in the bud stage, have been quite surpassed. The best new varieties now have—in addition to good colour—constitution, form, and, in many cases, fragrance. No better material could be desired for a display in the home garden at this season of the year. To make the best of it the selection of varieties and arrangement in the garden require considerable study. The old mistake of setting the plants singly at more or less regular intervals along a shrubbery or herbaceous border should be avoided. Roses may have a place in the shrubbery border if the most vigorous species and varieties are chosen; they are often admirably suited for such a position. Medium and dwarf varieties, however, never look better probably than in special beds in a rather open position with a shrubbery border for a background and for shelter purposes.

In dry localities hard-wooded plants set out during the spring may now require watering and possibly a mulch on the surface of the ground over the roots, to retain the moisture. Those set against a wall are specially likely to need this attention until the roots have spread to moister ground.

Aphides are a universal pest on young growth in dry weather. Systematic weekly attention will protect choice plants effectively. A puff or two of a strong soap solution will destroy the colony, or the addition of a little nicotine may be made to dispose of the more difficult kinds.

Rambler roses growing in positions where neat training is desirable may now have the old flowering shoots removed and the young growths tied in to take their place; if there are more of these than is necessary they should be thinned out.

During the month of January cuttings and layers of soft-wood plants may be taken.

—*W. C. Hyde, Horticulturist, Wellington.*

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

JAUNDICE IN EWE.

J. G. H., Te Kawa West :—

I opened up a ewe that died, and found that the gall-bag was about five times its normal size, full of gall, and that the rest of its organs were quite healthy looking. Could you tell me if it would be the gall that was the cause of its death? The fat was discoloured and yellowish.

The Live-stock Division :—

It is quite likely that this ewe died from jaundice, and that there was a blockage of the gall-duct that leads into the intestine.

UTILIZATION OF MANURE FROM DAIRY SHED.

T. B. C., Onehunga :—

I desire information about means whereby the dung and urine, which is a most valuable manure, from a dairy shed could be conserved.

The Fields Division :—

Under New Zealand conditions, the only method in practice is to catch the wash from the shed in a tank, whence it is pumped into a barrel or tank on wheels and distributed daily over the fields. The best practice with the dung is to distribute daily on to the fields, avoiding the collection of heaps at the shed.

RIPENING OF EARLY SUMMER PEARS.

P. D. L. H., Gisborne :—

A dessert-pear tree, twenty years old, sets a heavy crop of fruit which always looks quite healthy until about the end of December. At that time the fruit is large and quite green; the pears then commence to drop off, the stem comes away from the twig, not from the fruit, which to the naked eye does not look different from a picked fruit.

The Horticulture Division :—

It is quite natural for early summer pears to wither or decay if they are kept for even a comparatively short time. The variety is probably Citron des Carmes, an early dessert pear which should be eaten before the green colour changes.

TRANSPLANTING OF VINES.

G. H. M., Wanganui River :—

Is it possible to transplant grape-vines successfully? Can the grape be propagated by layering the vines?

The Horticulture Division :—

Old vines can be transplanted successfully after cutting back the rods to an inch or two of the main stem and treating the roots in the same manner. You can obtain new vines by layering a rod of last season's growth, covering it with 3 in. or 4 in. of good soil. Each bud will grow a shoot and roots in the spring, and the following winter the rods can be divided into separate plants, and these removed to the permanent position or left *in situ* for another season.

TREATMENT OF BAD QUARTER.

W. C. A. B., Tangiteroria :—

Should a bad quarter in a cow be syringed out, and, if so, what solution should be used ?

The Live-stock Division :—

It is better to milk out a bad quarter four times daily than to syringe out with anything. Injections have been used with varying results, many different drugs used, and no better results obtained.

EGG-BOUND CONDITION OF HENS.

G. H. M., Seddon :—

Is there any cause of an egg-bound condition of hens known to your Department, or anything which makes for predisposition of this trouble ?

The Live-stock Division :—

Sometimes this condition is brought about through two yolks leaving the ovary and falling into the oviduct at about the same time, causing the formation of a double-yolked egg, which, owing to its abnormally large size, will not pass through the egg-passage, and as a result the bird is unable to expel it. This applies particularly to young hens in which the oviduct has not become sufficiently dilated to enable a particularly large egg to pass through it freely.

Of course, a pullet may have trouble in passing the first egg or two, until the egg-passage is stretched to its normal capacity. Difficulty in this direction is frequently indicated by the fact that a pullet's first egg is more or less streaked with blood. Old hens which are predisposed to lay large eggs may experience similar difficulty in passing an egg as a result of being in an overfat condition, while, further, the oviduct may not be functioning in a proper manner, resulting in the formation of a misshapen egg, or one with a very rough shell which cannot be passed in a normal way.

Egg-binding may also be brought about owing to an egg becoming broken in the egg-passage, which may occur as a result of a bird being roughly handled or being chased by dogs, &c., while it is commonly caused through the bird's inability to secure sufficient broken sea-shell, &c., in order to secure the necessary lime as a shell-forming material.

CONTROL OF BITTER-PIT IN APPLES.

C. J., Rotorua :—

My Ribstone Pippin apples had bitter-pit rather badly last year. Would liming the ground or any special manure prevent a recurrence ?

The Horticulture Division :—

Bitter-pit is a disease of the apple which has not yet been brought under satisfactory control, and is still the object of considerable research. Sudden fluctuations in the water content of the soil during the development of the fruit is considered to be an important factor in causing the trouble. This condition may be avoided in many cases by improving drainage and increasing the humus content of the soil ; or, if the ground is heavy and hard, an application of lime, as you suggest, with a view to making it friable and so less liable to dry out seriously would very possibly be helpful.

SEED OF PAMPAS GRASS.

F. E., Bulls :—

When and how can the seed of pampas grass be saved ?

The Systematic Botanist :—

Pampas grass is a shy seeder, as both male and female plants need to be present for fertilization. The female flower trusses ripen in the autumn, and the seed could be threshed out by hand.

WEATHER RECORDS: NOVEMBER, 1934.

Dominion Meteorological Office.

NOTES FOR NOVEMBER.

NOVEMBER was a very remarkable month. Conditions were unusually uniform throughout the country and everywhere were characteristic of a summer rather than a spring month. The rainfall was the lowest for many years. Temperatures were much above normal, and, although higher mean temperatures have been experienced in previous years, it has never been so uniformly warm. There was no really cold weather. At numbers of places the extreme maximum temperature was the highest ever recorded in November. The lack of rain and the continuous sunshine are causing pastures to become browned in many places, especially on hill slopes. The severity of the heat has, however, been mitigated so far as vegetation is concerned by the lack of wind, especially very strong winds. Though rain is now badly needed, there is still ample feed in most districts. Stock are in good condition and the milk-yield is fairly well maintained. Lambs have fattened well. Shearing has been carried on with little trouble. Crops are, on the whole, doing satisfactorily. Hay is being harvested and ensilage being stored unusually early.

Rainfall.—Good rains were experienced in North Auckland, the November average being considerably exceeded. The same was the case at a few places in the interior of the North Island and the Bay of Plenty district. These areas formed only a small fraction of the whole country, and in all other parts there was a very marked shortage. Large areas of the west coast of the South Island received less than a quarter of the normal rainfall, and for the whole Island the average deficit was about 50 per cent.

Temperatures.—Temperatures were much above normal, especially at inland stations, the departures in numbers of cases exceeding 5° F. There were very few frosts, and at few places were any sufficiently severe to cause damage.

Sunshine.—The month was a very sunny one, the average being exceeded in practically all districts. Blenheim had 276·8 hours, New Plymouth 275·8, and Wellington 274·9.

Storm Systems.—Storms were conspicuous by their absence over New Zealand. During the first few days a very shallow low-pressure trough moved northwards over the Dominion and caused fairly general though mainly only light to moderate rain.

On the 8th a very deep cyclone developed over Tasmania, but it moved southwards and filled up before reaching New Zealand. The same happened again at the end of the month with a cyclone which caused widespread devastation in Victoria.

The only general rains occurring during the month were associated with a storm which developed into a deep cyclone over the Tasman Sea on the 17th. Rain was very widespread from the 17th to the 20th and the totals were almost everywhere considerable. Even this storm, however, was rapidly losing energy when it crossed New Zealand and the amount of rain produced by it was rather disappointing.

Another slight disturbance passed between the 26th and 28th and caused some scattered showers.

Thunderstorms were rather frequent during the month, and a slight tornado occurred near Christchurch on the 19th. Practically no winds of gale force were experienced. A conspicuous feature of the weather was the way in which disturbances which were vigorous over Australia petered out before reaching New Zealand, and especially the absence of strong westerly winds in such disturbances as reached us. In consequence, even the wettest parts of the west coast sometimes went entirely without rain.

RAINFALL FOR NOVEMBER, 1934, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.	Total for Year to Date.	Average for Year to Date.
	North Island.					
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitaia	2·76	14	1·47	2·75	56·45	51·68
Russell	3·95	13	1·25	2·22	73·39	47·39
Whangarei	4·62	17	0·97	2·81	58·93	57·52
Auckland	1·17	9	0·26	3·28	41·16	41·96
Hamilton	2·80	9	0·85	4·01	39·06	46·04
Rotorua	4·92	11	1·27	4·15	48·49	51·25
Kawhia	1·82	9	0·95	4·52	43·04	50·42
New Plymouth ..	2·48	8	1·11	4·76	48·99	55·56
Riversdale, Inglewood ..	3·61	7	1·29	9·12	75·21	96·69
Whangamomona ..	3·29	6	1·15	7·39	60·51	71·92
Hawera	2·03	6	1·08	3·78	35·57	41·96
Tairua	2·26	15	1·24	3·63	51·87	60·07
Tauranga	2·09	10	0·48	3·25	49·84	48·80
Maraehako Station, Opotiki	4·12	14	1·33	3·16	42·64	50·45
Gisborne	1·67	8	0·45	2·88	24·98	42·83
Taupo	4·90	12	1·90	3·32	39·56	40·75
Napier	1·38	7	0·61	2·36	25·88	32·77
Hastings	1·07	7	0·40	1·82	22·45	29·98
Whakarara Station ..	2·17	7	0·62	..	43·48	..
Taihape	2·30	10	0·89	3·47	28·05	33·69
Masterton	1·85	3	1·08	2·73	31·88	35·67
Patea	2·25	9	1·09	4·01	37·78	41·29
Wanganui	1·21	9	0·60	3·24	30·38	33·42
Foxton	2·18	5	1·30	3·20	31·36	29·87
Wellington	2·16	8	1·19	2·90	43·29	38·24
	South Island.					
Westport	2·08	10	0·75	8·85	78·94	88·35
Greymouth	2·00	8	0·62	9·10	84·44	92·90
Hokitika	2·23	7	0·90	10·68	84·66	104·79
Ross	2·09	6	0·84	13·86	102·80	123·44
Arthur's Pass ..	2·23	4	1·08	16·11	144·32	147·80
Okuru, South Westland	4·16	8	1·86	12·60	..	133·50
Collingwood	5·57	11	1·32	6·90	86·94	89·19
Nelson	2·73	11	0·80	2·95	35·55	34·88
Spring Creek, Blenheim	1·00	5	0·36	2·39	30·17	28·18
Seddon	1·27	6	0·40	1·85	28·00	22·84
Hanmer Springs ..	2·16	12	0·81	3·52	48·63	41·42
Highfield, Waiau ..	0·74	4	0·24	2·52	33·74	30·64
Gore Bay	1·88	9	1·18	2·12	37·64	28·70
Christchurch	1·56	7	1·26	1·90	26·37	22·84
Timaru	0·93	7	0·33	1·90	25·18	20·20
Lambrook Station, Fairlie	1·38	7	0·59	1·93	28·64	22·30
Benmore Station, Clearburn	0·90	5	0·59	2·05	23·35	22·30
Oamaru	0·94	10	0·46	1·92	23·27	19·76
Queenstown	0·38	6	0·11	2·78	30·33	27·94
Clyde	1·17	6	0·46	1·34	5·96	13·46
Dunedin	1·43	6	0·65	3·22	38·45	33·25
Wendon	1·41	7	0·52	2·72	25·29	27·14
Balclutha	0·55	5	0·28	2·48	28·61	23·06
Invercargill	1·93	16	0·55	4·39	36·51	41·69
Puysegur Point ..	6·61	16	1·37	8·25	65·85	78·09
Half-moon Bay ..	..	..	..	5·79	..	53·89